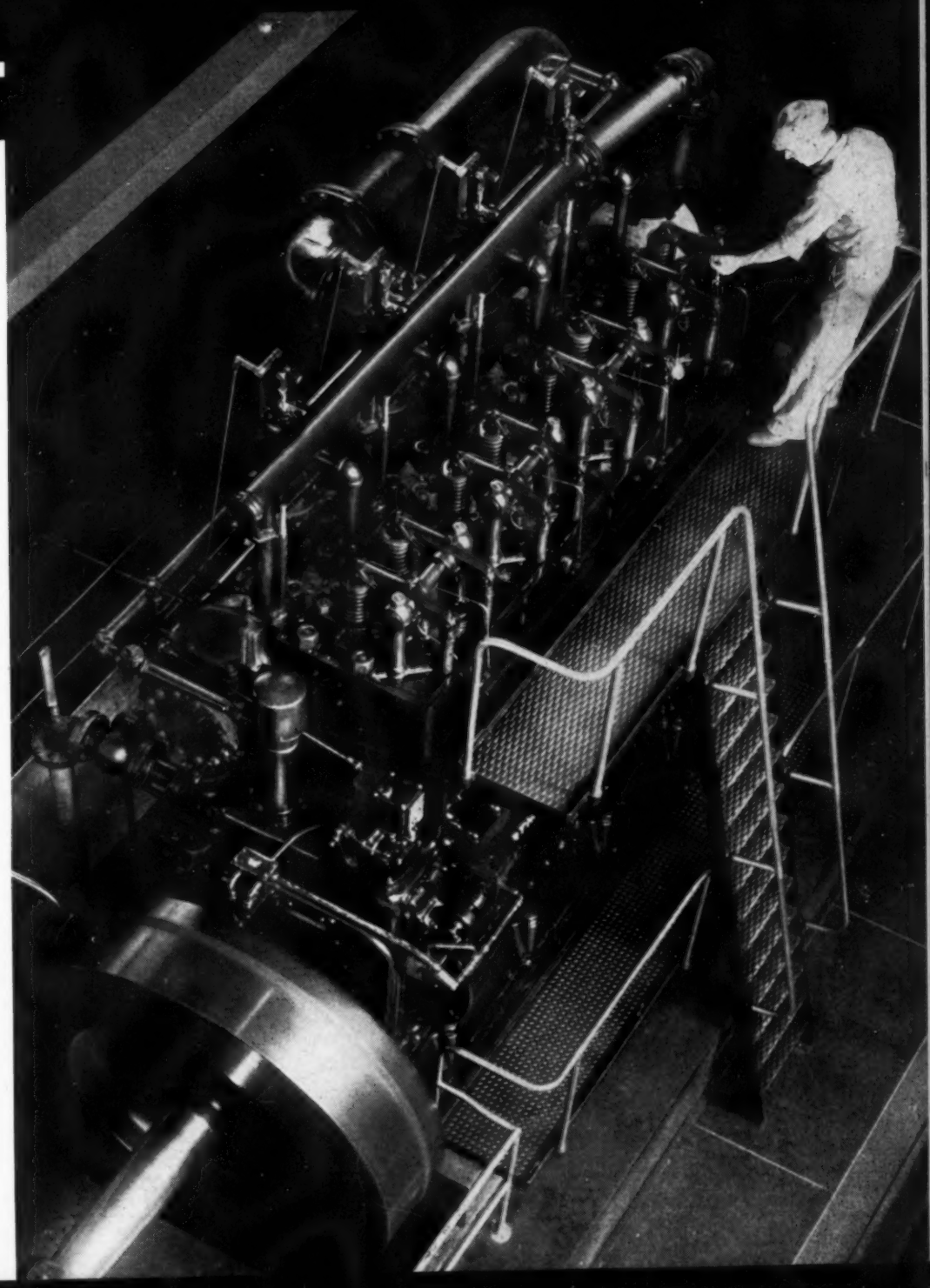
WATER & SEWAGE WORKS



DUAL FUEL
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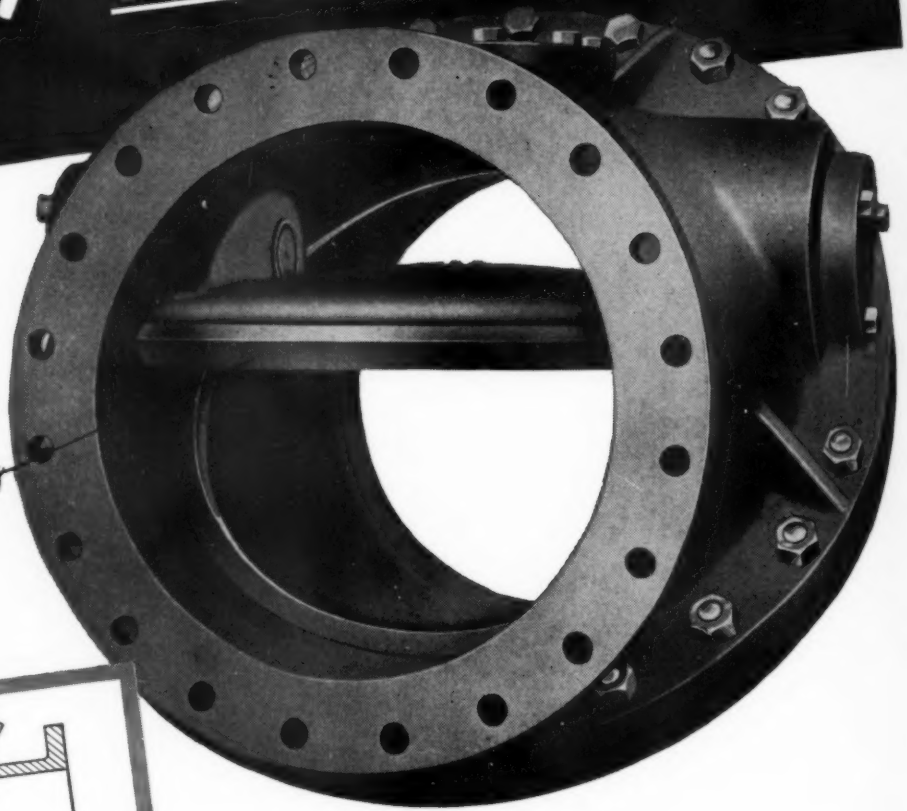
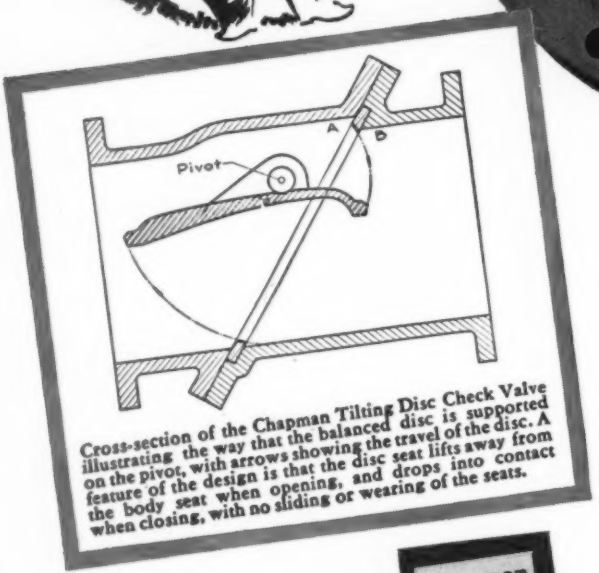
A
GILLETTE PUBLICATION

CHAPMAN TILTING DISC CHECK VALVES

Close Seat WITHOUT SLAMMING WITHOUT RUBBING





Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

Chapman Tilting Disc Check Valves are made in iron and steel. *Send for bulletin.*

Chapman Tilting Disc Check Valves are *different* in design. Unlike ordinary swing check valves, they have a balanced hinge-pinned disc which works *with* the stream. The disc closes *quickly* and *quietly* because of the cushioning effect of the stream against the short flap of the disc. This prevents slamming and the resultant pipe-line stresses.

On opening, the disc seat *lifts away* from the body seat without rubbing; when closing, it drops freely in place. Also the disc rides smoothly on the flow of the stream, minimizing wear on bearings and hinge pins.

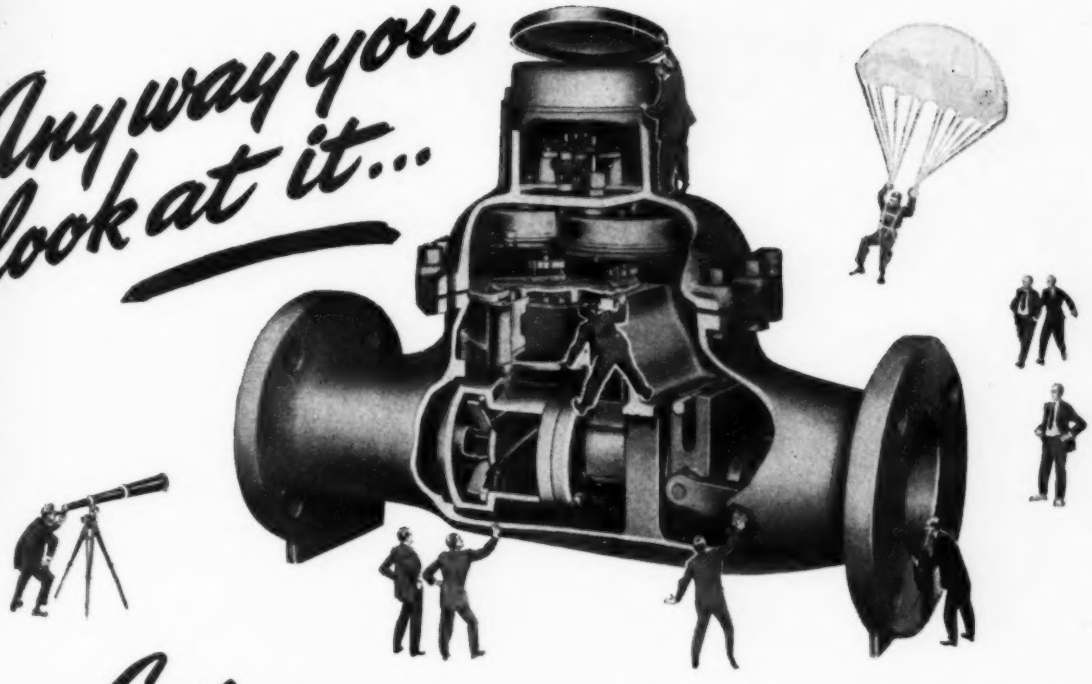
Maintenance costs are cut, and head losses are reduced as much as 65% to 80% over those experienced with conventional type check valves. And when installed on pump discharge lines, substantial power savings are effected.

The CHAPMAN Valve Mfg. Co.

INDIAN ORCHARD, MASS.

WATER AND SEWAGE WORKS, "Reg. U. S. Pat. Off.," October, 1947. Volume 94. Number 10. Published monthly by Gillette Publishing Co., 22 W. Maple St., Chicago 10, Ill. Per Copy, 25c. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, March 12, 1946, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Anyway you look at it...



You'll *Save* with this revolutionary compound meter

SAVE time reading meters; eliminate errors

In this meter alone, measurement by both the velocity and displacement metering units is recorded on a *single* register. This feature speeds meter reading and eliminates the possibility of error in reading and adding together the totals of the two registers normally used on compound meters.

SAVE in shipping, handling and installation

Size for size this meter is more compact and lighter in weight than other compounds. One man can install a three inch Pittsburgh-Empire without special handling equipment.

SAVE pressure absorption; gain greater accuracy

A horizontally positioned propeller, mounted on hard rubber roller bearings combined with a positive, swing action valve provides a straight-through flow stream; cuts pressure loss and retains accuracy at the changeover point.

SAVE on low flow rate accuracy

Pittsburgh-Empire compounds are fitted with sensitive, time-proven Empire oscillating piston displacement meters to accurately measure the extremely low flow rates that, over a period of time, can accumulate into a surprisingly large volume.

SAVE on maintenance and service

The space conserving interior arrangement of parts has been engineered for maximum maintenance ease and accessibility. All units dismantle through the meter cover and, if necessary, can be serviced without removing the meter from the line.

Write for Bulletin W-803

ROCKWELL

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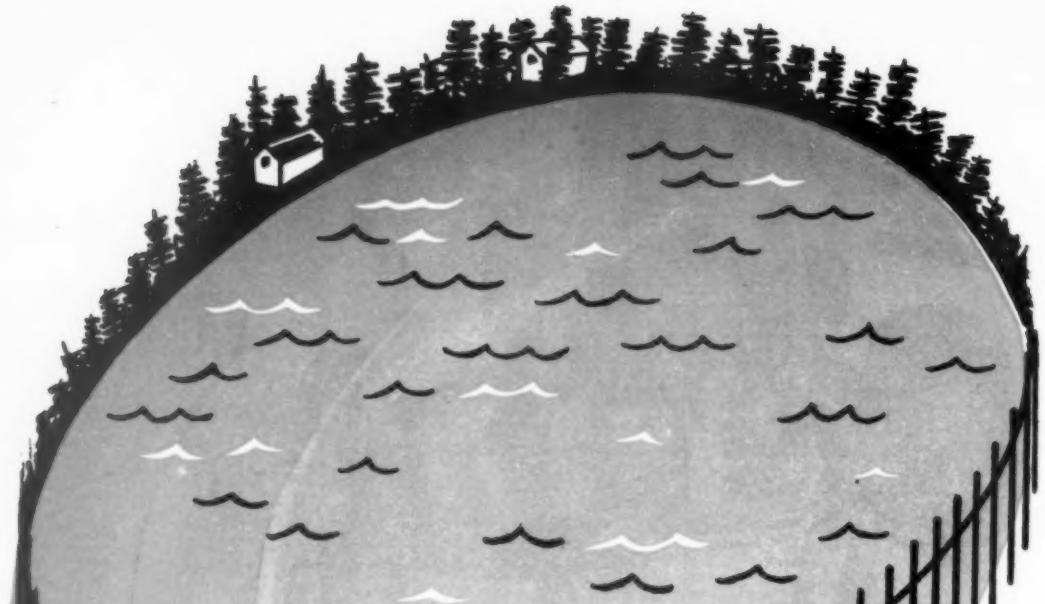

this keeps out humans,

but... it won't keep out algae, phenols and other contaminants.
Such pollution in your raw water causes tastes and odors—
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A powerful oxidizing agent, Chlorine Dioxide attacks algae...oxidizes phenols and other troublesome compounds...destroys bacteria as well. Tastes and odors are usually eliminated. Your community is served with water that is *good to drink*.

Municipalities the country over are standardizing on the new Mathieson Chlorine Dioxide technique. Write us for details. THE MATHIESON ALKALI WORKS (Inc.), 60 East 42nd Street, New York 17, N. Y.

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COMING!

Transite Pipe Performance Record

Is revealed in a report from Winnipeg, Canada, covering an asbestos-cement water main after 14 years of service under corrosive conditions. Presented and discussed are the recently conducted field and laboratory tests made for the purpose of comparing the flow capacity, friction losses, strength, and other physical characteristics of the pipe after 14 years of service, with those of the pipe as originally laid. This interesting report comes from—

WM. D. HURST, City Engineer,
Winnipeg, Canada.

Hydraulics for the Practical Water Works Man

Is a continuing series of articles by Prof. R. W. Angus of Toronto, for many years a teacher of hydraulics, and a consulting engineer.

How a Public Relations Program Paid Off

Is the story of a Public Relations program which preceded a bond election for funds to enlarge and improve a sewage treatment plant. The approach to the public through a well conceived and effectively presented educational program directed to civic groups, the local Chamber of Commerce, The Rotary Club, The Lions Club, etc., is explained. The net result was that the much discussed bond election carried with a comforting margin to spare. The plan and program is explained by—

WM. KUNSCH, Engr.-Mgr.,
Urbana-Champaign San. Distr., Urbana, Ill.

Employer-Employee Relationships in Water Utilities

Is the subject of a paper which reveals experiences of the author's company in the direction of practicing the adage that "good public relations begin at home." This paper is by—

J. W. HEINEY, Manager,
N. J. Division, Water Utilities Service Co.,
Palmyra, N. J.

Betterments Projected for the Sewage Treatment Plant of Madison, Wis.

Is a paper which describes the several major improvements and enlargements planned for the Activated Sludge plant of Madison, Wis., and the specific reasons for adopting the various processes and equipment are set forth by—

C. H. BECKER and D. R. RIDDELL,
Greeley and Hansen, Engrs. of Chicago.

The Operation of Small Filtration Plants

Is the subject of a new series of short articles dealing with the operation and maintenance of small filtration plants by an author who has had considerable experience in filter plant and pumping station operation—

A. E. CLARK, Gen'l Mgr.,
Nashville Sub. Utilities Dist., Nashville, Tenn.

Are Heated Sludge Dewatering Beds Economical?

This is the question which caused a special study to be made by a designing engineer. The considerations of facts, together with probable advantages, and the computations of costs involved in artificial heating and ventilation of glass covered sludge beds are presented. The conclusions reached we leave to the reading of this clarifying article by—

ALBERT B. KOZMA, Engineer,
Wm. C. Olsen Engrs., Raleigh, N. C.

Some Pointers on Hydrant and Valve Maintenance

Are given by an operator with considerable experience in a short article of high value to the small plant operator as well as those connected with the large systems. The author is—

J. G. CARNES, JR.,
Water Works Service Co., Inc., New York, N. Y.

VOL. 94, NO. 10 — CONTENTS — OCTOBER, 1947

Significance of Legislation Forbidding Strikes by Public Employees 353
By Wendell R. LaDue
Akron, Ohio

AWWA Papers and Discussion (Second Installment 1947 AWWA Convention Report) 359

Penna. Water Works Operators Hold 20th Meeting at State College 365

Fluorine Determination in Water Using an Electrophotometer 369
By A. R. Todd
Wheeling, West Virginia

Taste and Odor Control in Water Purification (A Book Review) 370

Penna. Sew. Wks. Assn. Comes of Age and Changes Name. 371

Diesel and Gas Engine Equipment 379
By A. M. Boehm
Harrison, New Jersey

Sewage Works Federation Proceedings (Second and Concluding Installment 1947 FSWA Convention Report) .. 384

Meetings Scheduled 88-A

"Here and There" with Doc Symons 89-A

Manufacturers' and Equipment News 96-A

Literature and Catalog Reviews 104-A

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MODERN WATER FILTRATION SYSTEM

INCREASES EFFICIENCY

LOWERS COSTS

Installing an ALOXITE aluminum oxide porous plate underdrain system in rapid sand filters is the modern solution to expensive problems of water filtration.

Its simple construction and operating principles assure efficiency and economy. The use of graded gravel is eliminated. There is no problem of mud ball formations, upsetting or loss of filter media. Backwash is complete, uniform and positive. Maintenance is easier. Corrosion resistant ceramic plates are easily cleaned and stay clean longer. Initial head loss through the system remains lower. Reduced filter height cuts down filtering and backwashing operating heads.

Add to these advantages, the elimination of costly and tedious jobs of regrading sand and gravel. Consider the fact that no metal parts subject to corrosion are required. Then it is easy to understand why the installation of ALOXITE underdrain systems has gained popularity.

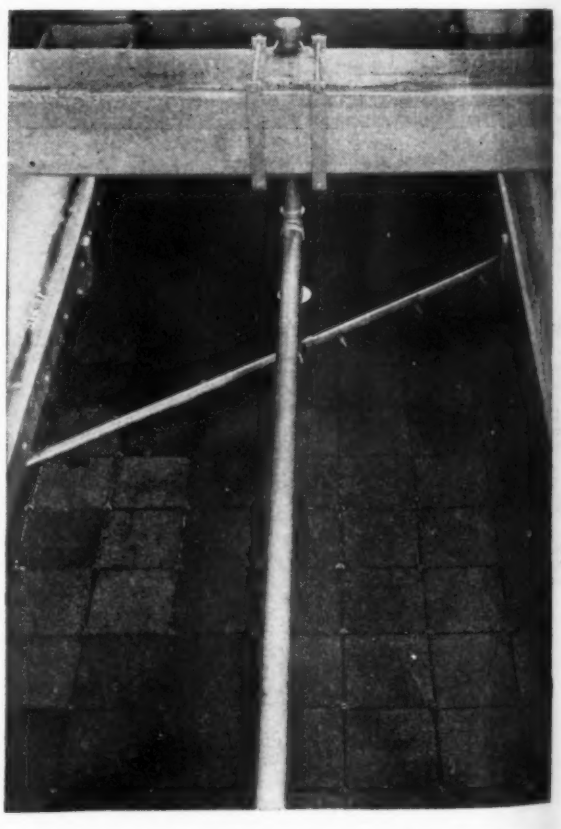
More City Filtration Plants Turning To ALOXITE Underdrain System

Consistent troubles with filters has led many cities to investigate the ALOXITE Underdrain System. Here is the typical experience of one.

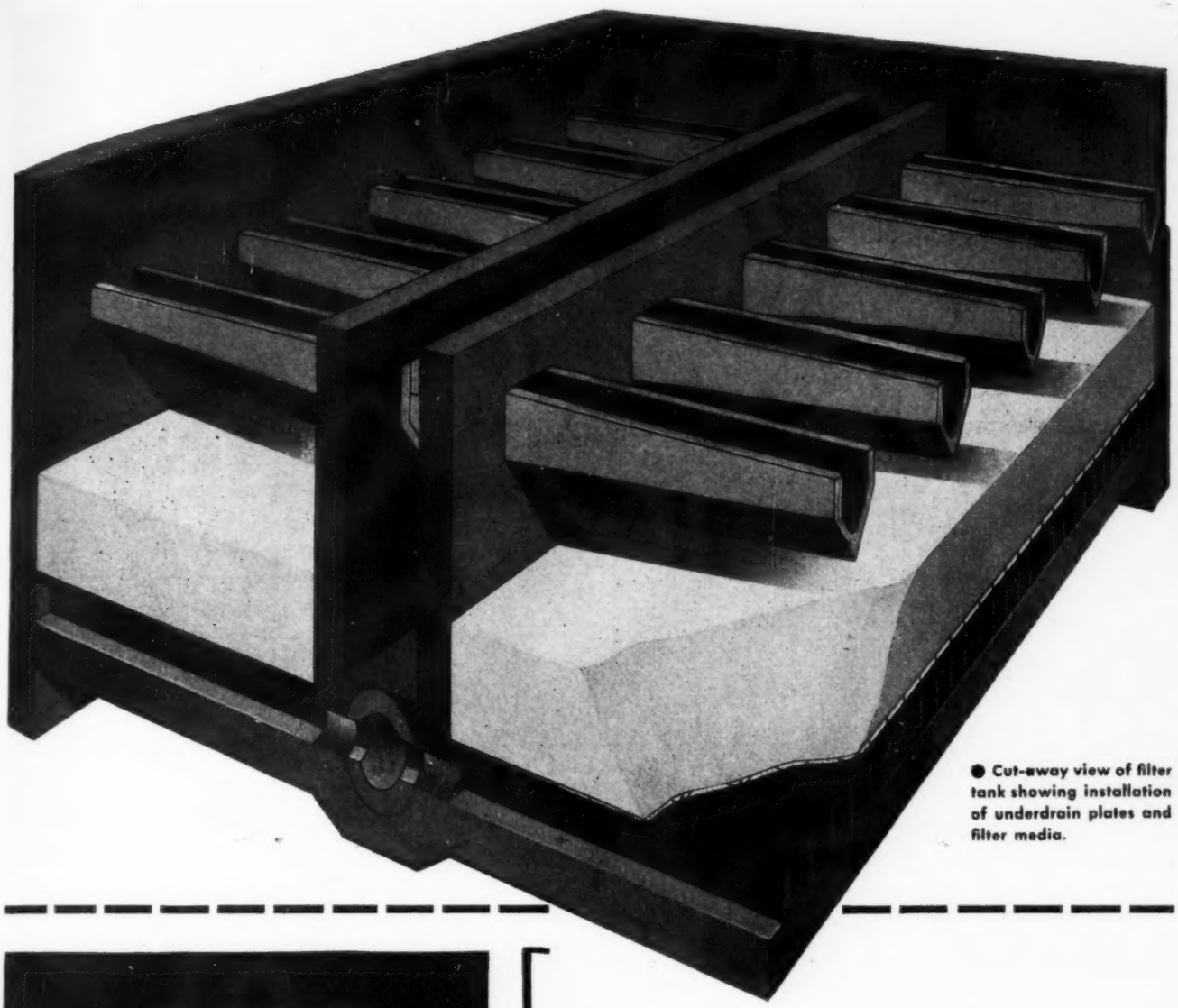
"Before modernizing the two filters in this plant, each with a capacity of ½ MGD, service was unsatisfactory...maintenance expenses high. Complete shutdowns for regrading and screening sand and gravel were required regularly. This was complicated by mud ball formations.

"Switching to ALOXITE plates, all these and more troubles are entirely eliminated. Less backwashing water is used and many other important savings are recorded."

This experience is confirmed by an expanding list of users who followed the suggestion to modernize with ALOXITE underdrain plates. If you are planning new construction or a modernizing job—talk it over with our technical staff. Get the facts before you act. Write Department O-107, The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.



Typical installation in municipal water filtration plant.



● Cut-away view of filter tank showing installation of underdrain plates and filter media.

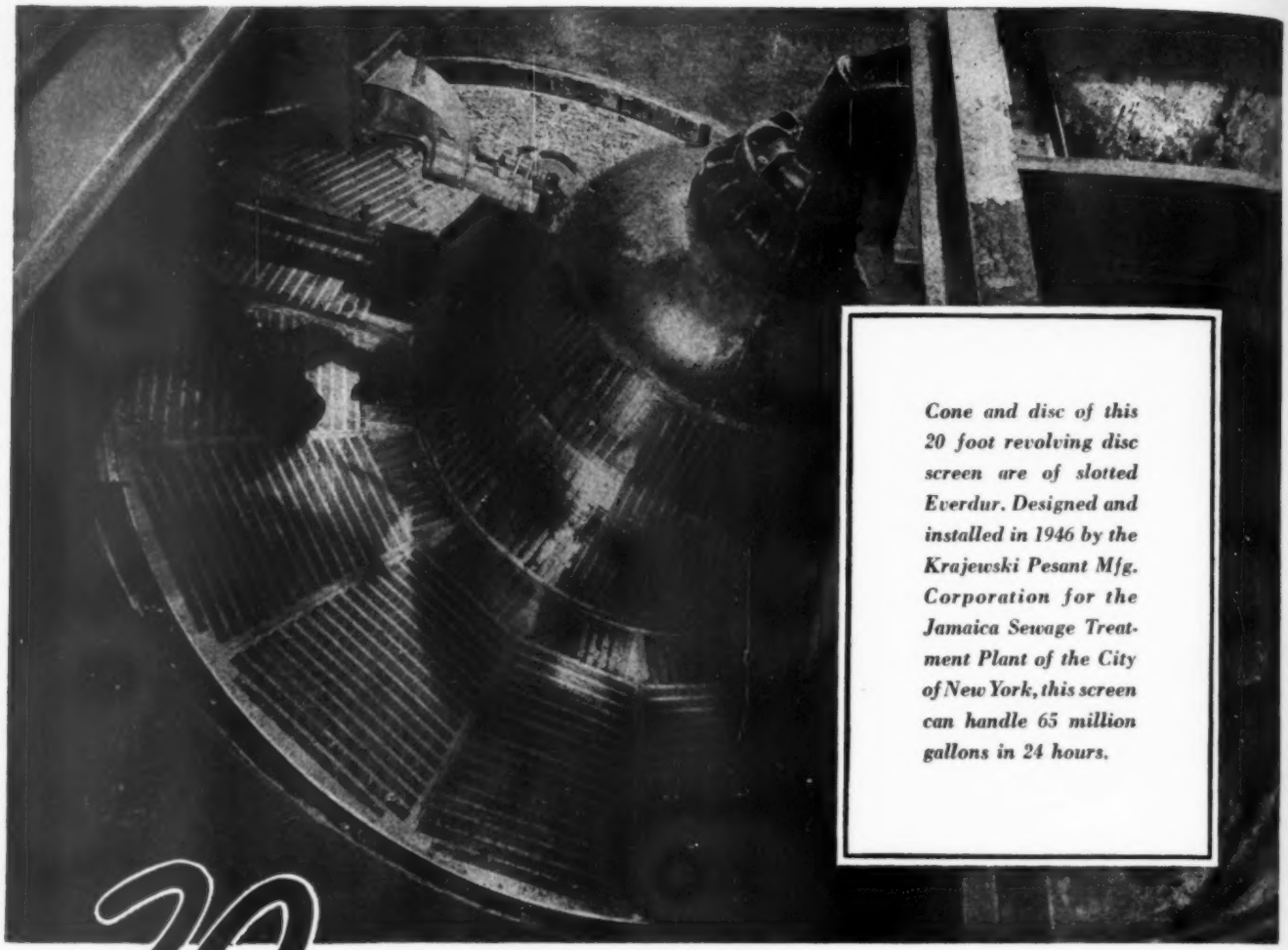
A FEW ADVANTAGES of this Modern Underdrain System

1. No mud ball formations
2. Graded gravel eliminated
3. Low head loss
4. Less wash water
5. Uniform backwashing
6. Low maintenance
7. No clogging or corrosion
8. Longer filter runs
9. Easy to operate
10. Easy to install

Underdrain Plates BY CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company



Cone and disc of this 20 foot revolving disc screen are of slotted Everdur. Designed and installed in 1946 by the Krajewski Pesant Mfg. Corporation for the Jamaica Sewage Treatment Plant of the City of New York, this screen can handle 65 million gallons in 24 hours.

20 YEARS OF SEWAGE TREATMENT SERVICE PROVE *Everdur* SUPERIORITY

EVERDUR* copper-silicon alloys have achieved a consistent record for outstanding service and long life in hundreds of sewage and water works installations . . . over a period of twenty years.

Everdur alloys are notable for excellent corrosion resistance and great strength. Depending on the type or composition, they may be worked hot or cold, have good machining properties and are readily formed, forged and welded in producing lightweight built-up equipment of exceptional durability. Everdur equipment installed in 1927 is still in service and in excellent condition after constant use under highly corrosive conditions.

For detailed information write for Publications E-11 and E-5.

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Wherever you go — whatever you do
You use products made better with BECKMAN pH CONTROL!

Did You Know These Beckman pH Facts?

...***that Beckman pioneered modern glass electrode pH equipment,*** transforming the cumbersome laboratory apparatus formerly used into a compact, practical, portable instrument that paved the way for today's simplified pH measurement and control?

...***that the first completely automatic glass electrode pH indicator,*** recorder and controller was pioneered by Beckman? Operating entirely without batteries, this instrument made automatic process control accurate, convenient, practical—and is today widely used in all parts of the world.

...***that Beckman pioneered the High Temperature Glass Electrode system*** which, for the first time, enabled continuous pH measurements to be made at temperatures up to 212°F (100°C)? This electrode system is of tremendous value wherever hot process fluids must be controlled.

...***that the High pH Glass Electrode system is also a Beckman development?*** This unique glass electrode unit can be used to measure high pH values *even in the presence of sodium ions*... and extends the usefulness and accuracy of glass electrode equipment to many industries where alkaline solutions in combination with sodium ions have heretofore presented difficulties.

...***that the above are only a few of many developments that make Beckman pH Equipment the most advanced, the most accurate, the most adaptable in the field of pH?***

The tires you ride on are made with the aid of Beckman pH Control. It was found that coagulation of the synthetic rubber is very sensitive to variations in the pH (acidity or alkalinity) of the processing solutions. Therefore, Beckman Automatic pH Equipment is used to control these processes for efficiency and economy.

The motion pictures you see are processed with the aid of Beckman pH Control. The developing laboratories of the major motion picture studios discovered that Beckman pH Equipment gives better control of the quality and uniformity of the film developing processes, insures clearer prints, less waste and better projection qualities.

The water you drink is probably Beckman pH Controlled. In more and more municipal water systems, purification of the drinking water is being regulated with the aid of Beckman pH Equipment, thus insuring a water supply that is both pure and uniform—plus important savings in treating costs.

The food you eat is another item that, today, is made better and more uniform with the aid of Beckman pH Control. It has been found that virtually all types of food processes—from baking crackers to canning meats—are performed more efficiently, more economically with the aid of Beckman pH Equipment.

Are YOU Using This Cost-Cutting Tool in Your Plant?

ONLY A FEW YEARS AGO pH control was more of a laboratory curiosity than a cost-cutting industrial tool. But today—largely through the far-reaching developments of the Beckman research staff—modern pH control has become an indispensable tool for speeding chemical processes, safeguarding quality, reducing waste and simplifying production operations throughout industry. *In fact, wherever there's water there's pH...and wherever water or water processes are used, chances are the job can be done quicker, better, at lower cost with Beckman pH Control.*

How About Your Product?

The above are but a few of the innumerable ways alert industries are cutting costs, improving product quality, reducing waste and making other vital savings with Beckman pHControl. Have you investigated the vital savings it can make in *your* operations? Our engineers will gladly study *your* pH problem and suggest ways that Beckman pH Control can save money for you. *Beckman Instruments, National Technical Laboratories, South Pasadena 20, California.*

FREE...

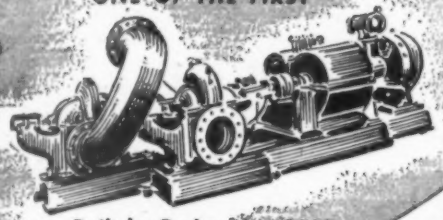
"What Every Executive Should Know About pH"

Helpful, informative, non-technical. Send for your copy.

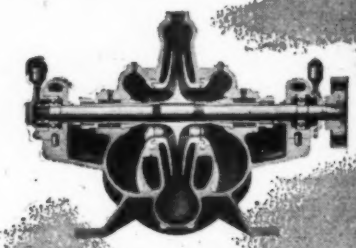
BECKMAN **INSTRUMENTS CONTROL MODERN INDUSTRIES**

45 Years of PUMP IMPROVEMENT

ONE OF THE FIRST

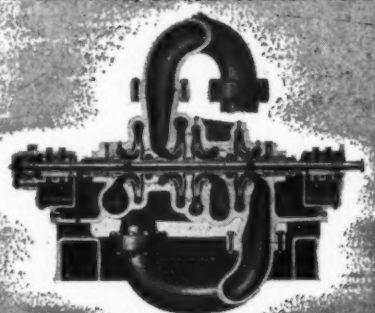


Built by De Laval in 1902

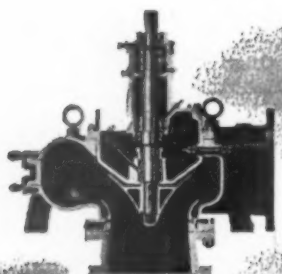


SINGLE STAGE, DOUBLE SUCTION PUMP

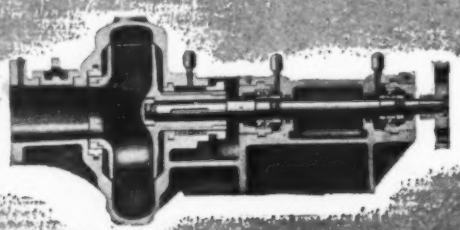
Modern De Laval centrifugal pumps represent the culmination of more than 45 years of continual improvement and perfection. This long period of concentration upon the problems of centrifugal pump design and application places at the user's command a complete line of modern, high quality pumps and a vast store of knowledge concerning pump application problems.



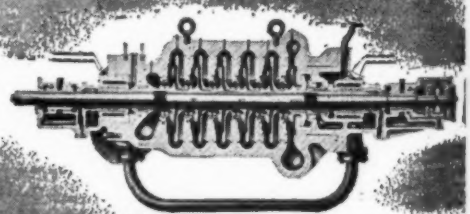
FOUR STAGE, OPPOSED IMPELLER PUMP



MIXED FLOW PUMP



CLOGLESS PUMP



HIGH PRESSURE, MULTI-STAGE PUMP

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styles...with a difference

It's easy to smile at the styles of yesterday but out of this original and practical idea have come the smartly functional, free-action sport styles of today. Many industries have been built by the courageous development of such progressive ideas. Niagara's early pioneering in the field of electro-chemicals has led to the tremendous increase in the utility and variety of these materials until today Niagara is "An Essential Part of America's Great Chemical Enterprise."

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60 East 42nd Street, New York 17, N. Y.

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YOU CAN COUNT ON minimum excavation costs with Transite* Sewer Pipe because Transite has an exceptionally high flow capacity (n=.010). This often permits the use of flatter grades and shallower trenches. This is a particularly important advantage where rock excavation is involved or where the pipe must be laid at or below the ground water line.

As an alternate economy, designers often take advantage of Transite's high flow capacity by specifying smaller diameter pipe.

Transite Offers Other Economies, Too. Right from the start, this pipe helps you cut sewage disposal costs. Transite's long 13-foot lengths and light weight mean lower handling costs. And fewer joints to assemble in the finished line result in faster, more economical installation.

Transite Reduces Treatment Costs. As a further economy, tight sleeve-type joints guard effectively against infiltration . . . reduce the load on the treatment plant. Thus, treatment costs are kept low . . . and plant capacity can be conserved for the increased loads incident to future community growth.

Transite Cuts Maintenance Costs. Made of asbestos and cement combined into a homogeneous material of great stability, Transite Sewer Pipe is corrosion-resistant both inside and outside. Tight joints safeguard against root trouble. And every Transite length is factory-tested for strength and uniformity. This adds up to low annual maintenance costs through the years.

Get All The Facts About Transite. If you are seeking ways to lower sewage disposal costs, you'll be interested in the many economies Transite Sewer Pipe can offer you. Send for free brochure containing further engineering data. Address Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

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JOHNS-MANVILLE JM PRODUCTS

Transite Sewer Pipe

DIAMOND *Liquid* CHLORINE

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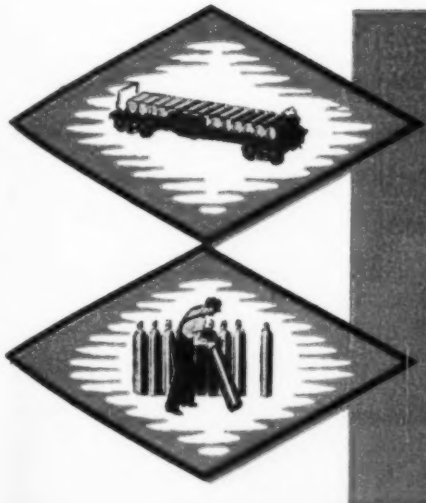

multi-unit cars, or in

cylinders, to best suit

your requirements

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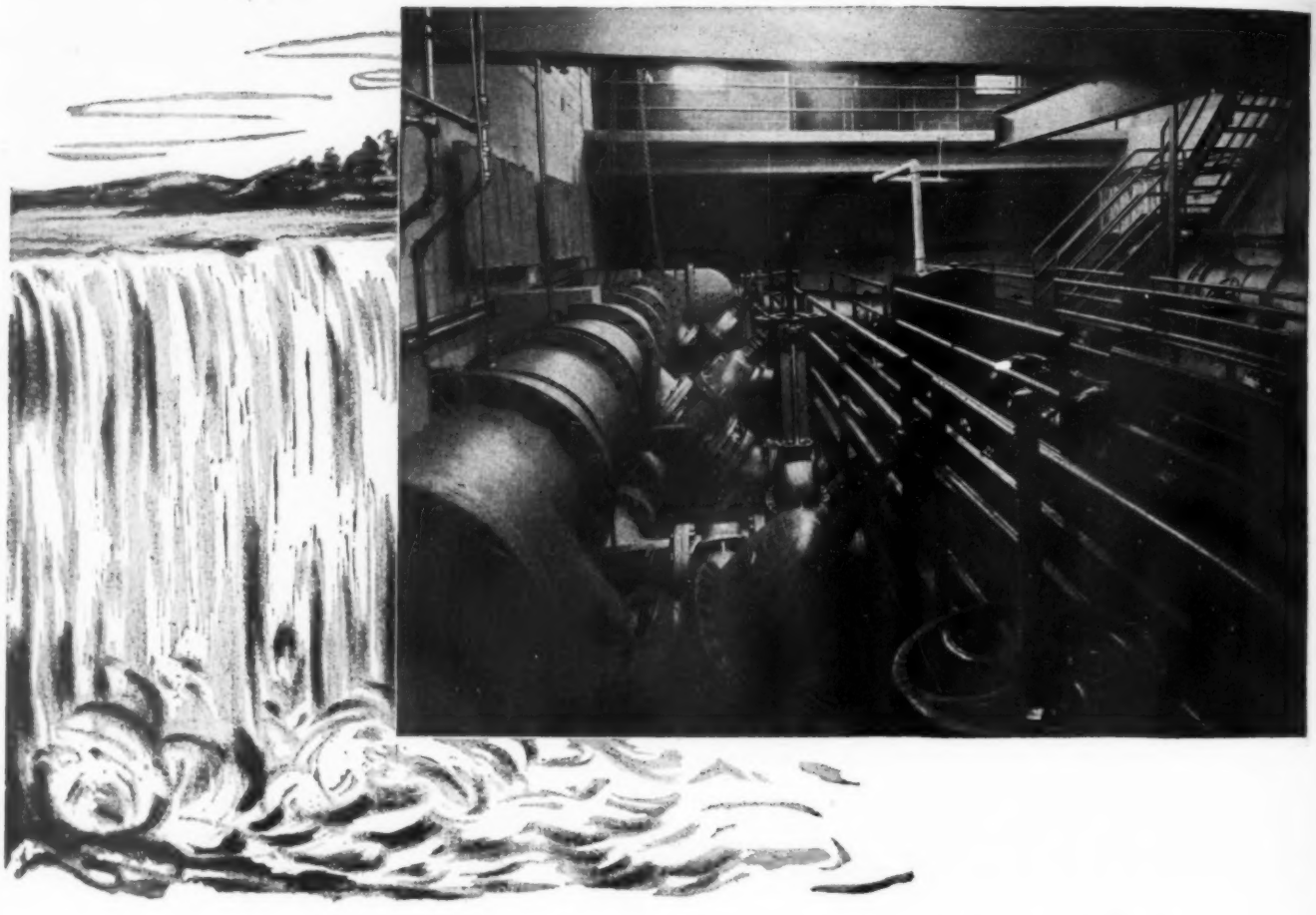
PITTSBURGH 22, PA., and Everywhere

CHLORINE

Water over the Dam . . .



controlled by LUDLOW!

IMMEDIATE SHIPMENT!

HUB END VALVES

DOUBLE GATE— A.W.W.A. Specifications 2 in. to 12 in.

Also Normal Delivery on Valves in Larger Sizes and *rapid delivery* on Hydrants.

This interior view of the Waterbury Control Station at Morris, Connecticut, shows one part of the battery of LUDLOW Double Disc Gate Valves that regulates Morris Dam and Wigwam Reservoir. Familiar stand-bys, they provide the smooth, accurate control that has marked LUDLOW performance since 1866 — a fact well appreciated by thousands of other communities in all parts of the country.

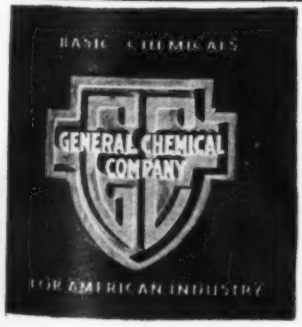
LUDLOW engineers will be glad to talk with you about your plans for replacements or new installations. There's no obligation.

V-71

The LUDLOW VALVE MFG·CO·INC·TROY·N·Y· SINCE 1866

CHEMICAL USERS' GUIDE To General Chemical Company Products for Treatment of Water, Sewage, and Industrial Wastes

PRODUCT	AVAILABLE FORMS	COMMERCIAL STRENGTH (MIN.)	SHIPPING CONTAINERS	APPLICATIONS
Aluminum Sulfate $Al_2(SO_4)_3 \cdot 14H_2O$ approx. *(Filter Alum)*	Commercial & Iron Free: Lump • Ground Powdered	17.25% Al_2O_3	Bags Barrels • Drums Bulk Carloads	Coagulant for water and sewage. Dewatering conditioner for sewage sludge. 1% Sol. pH 3.4.
Aqua Ammonia NH_4OH plus Water *(Ammonia Water)*	Colorless Liquid	26°Be. (29.4% NH_3)	Steel Drums Carboys	Used with chlorine to form chloramines for water disinfection.
Ammonium Aluminum Sulfate $Al_2(SO_4)_3 \cdot (NH_4)_2SO_4 \cdot 24H_2O$ *(Ammonia Alum) (Crystal Alum)*	Lump Nut Granular Powdered	11.2% Al_2O_3	Bags Fibre Drums	Coagulant for water. Advantageous for pressure filters. Supplies ammonia for chloramine formation. 1% Sol. pH 3.5.
Sodium Bisulfite, Anhydrous $Na_2S_2O_5$ *(ABS) (Sodium Metabisulfite)*	Powdered	97.5% $Na_2S_2O_5$ (Equiv. 65.5% SO_2)	Fibre Drums	Antichlor. Remove iron and manganese deposits from filter sand. 1% Sol. pH 4.6.
Sodium Silicate $Na_2O \cdot X(SiO_2)$ plus H_2O *(Water Glass) (Silicate of Soda)*	Viscous Liquid	38° to 52°Be. Various Ratios of Na_2O:SiO_2	Drums Tank Cars Tank Trucks	1. Aid in floc formation. 2. Prevent red water corrosion in distribution lines. 1% Sol. pH 12.7
Sodium Thiosulfate $Na_2S_2O_3 \cdot 5H_2O$ *(Hypo) (Sodium Hyposulfite)*	Crystals: Prismatic Rice Selected Universal Granular	99.75% $Na_2S_2O_3 \cdot 5H_2O$	Bags Barrels Fibre Drums	Antichlor. Water solution is neutral.
Sulfuric Acid H_2SO_4 plus H_2O *(Oil of Vitriol)*	Corrosive, oily liquid Various strengths	66°Be. (93.19% H_2SO_4)	Bottles Carboys Drums Tank Trucks Tank Cars	1. Reduce pH and alkalinity. 2. Regenerate carbaceous zeolites and ion exchangers. 3. Activate Baylis Silicate.
Potassium Aluminum Sulfate $Al_2(SO_4)_3 \cdot K_2SO_4 \cdot 24H_2O$ *(Potash Alum)*	Lump Nut Granular Powdered	10.7% Al_2O_3	Bags Fibre Drums	Coagulant for water. Slow, even rate of solubility desirable for solution pot feeders. 1% Sol. pH 3.52.
Sodium Sulfite, Anhydrous Na_2SO_3 *("Sulfite")*	Granular Powdered	98.5% Na_2SO_3	Bags Fibre Drums	Antichlor, oxygen remover. Weak solutions absorb oxygen readily. 1% Sol. pH 9.8.
Sodium Sulfate, Crystal $Na_2SO_4 \cdot 10H_2O$ *(Glauber's Salt)*	Crystal & Needle Crystal	96% $Na_2SO_4 \cdot 10H_2O$	Barrels Bags Drums	Neutral Solution. Boiler water treatment (maintenance of sulfate-carbonate ratio).
Sodium Sulfate, Anhydrous Na_2SO_4	Powdered	99.5% Na_2SO_4	Bags Barrels	Neutral Solution. Boiler water treatment (sulfate-carbonate ratio)
Trisodium Phosphate $Na_3PO_4 \cdot 12H_2O$ *(TSP)*	Crystal	98.5—103% $Na_3PO_4 \cdot 12H_2O$ (Equiv. 19% P_2O_5)	Bags Barrels Fibre Drums	Boiler water treatment. Cleaning compound. 1% Sol. pH 11.8-12.0.
Disodium Phosphate, Crystal $Na_2HPO_4 \cdot 12H_2O$	Crystal	98% $Na_2HPO_4 \cdot 12H_2O$ (Equiv. 19.5% P_2O_5)	Bags Barrels Fibre Drums	Boiler water. (Calcium and magnesium precipitation.) 1% Sol. pH 8.4.
Disodium Phosphate, Anhydrous Na_2HPO_4	Powdered Flake	96% Na_2HPO_4 (Equiv. 48% P_2O_5)	Same	Same as Crystal, but stronger product.
Sodium Fluoride NaF *(Fluoride)*	Powdered (white or blue colored: Nile Blue) Light or dense	90% and 95% NaF	Bags Barrels Fibre Drums	Fluorination of water supplies. (For information, consult with local health officers.)



FOR THE LABORATORY: Baker & Adamson Laboratory Reagents

For full information on these and other General Chemical Company products, write or phone the nearest Sales and Technical Service Office below.

GENERAL CHEMICAL COMPANY

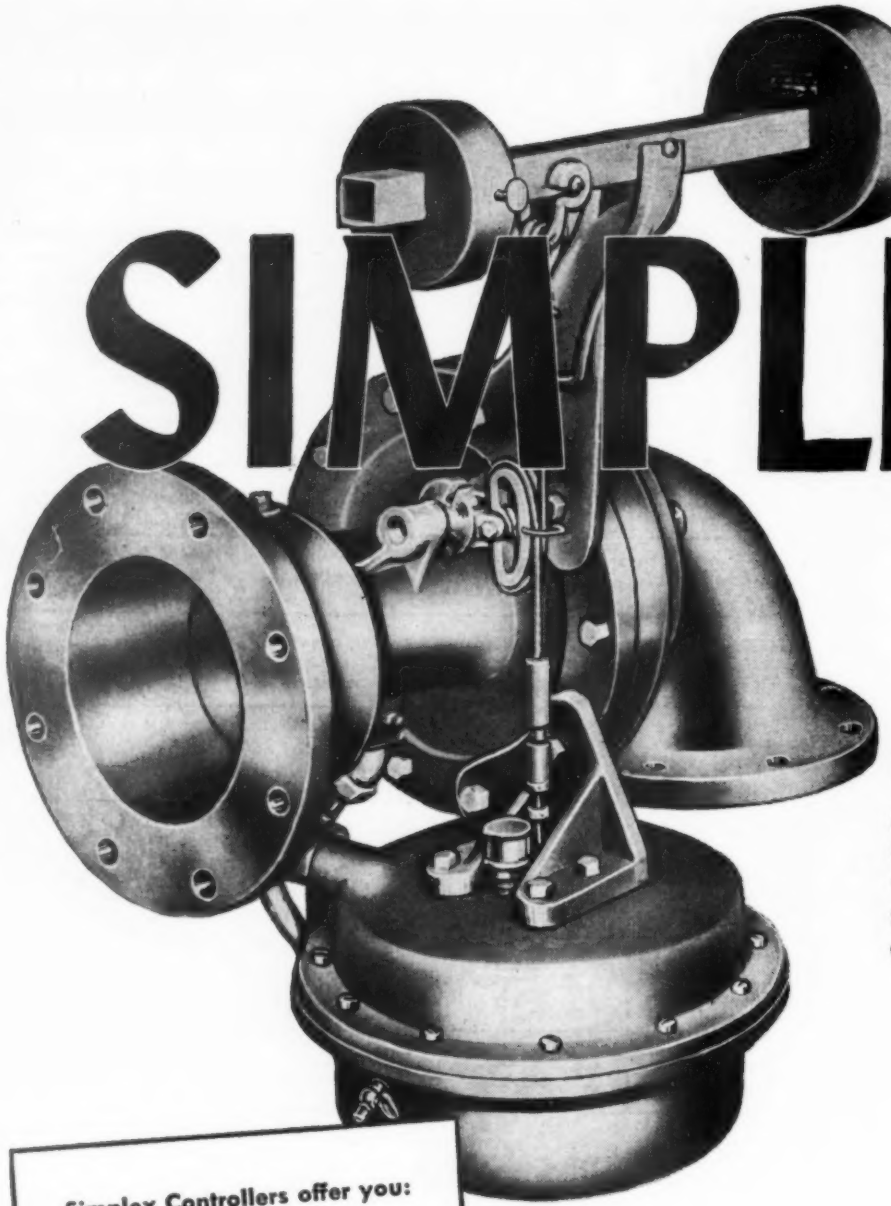
40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport Buffalo • Charlotte • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles Minneapolis • New York • Philadelphia • Pittsburgh • Providence • San Francisco • Seattle • St. Louis Wenatchee and Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

SIMPLEX



TYPE "S" CONTROLLERS—

Simplex Type "S" Rate of Flow Controllers are of the most advanced, proved design! They meet every requirement of modern filter plants!

Simplex Controllers offer you:

- compact design, low weight
- short length, low height, narrow width
- ball bearing mounted shaft
- hydrostatically balanced, patented guillotine valves
- simple, direct action design
- venturi tube type of differential pressure producer
- quick starting from open position
- instant response to slightest differential pressure
- extreme accuracy of control over long range

SIMPLEX TYPE "S" CONTROLLERS ARE USED extensively in controlling the rate of flow in filter effluent lines, as well as maintaining water levels on filter beds or in clear wells. They will maintain balance between input and output through filter plants. In addition they are used for controlling wash water.

Simplex Gauges for use with these controllers indicate and record the rate of flow or loss of head of water through the filters, or will measure water during washing cycles.

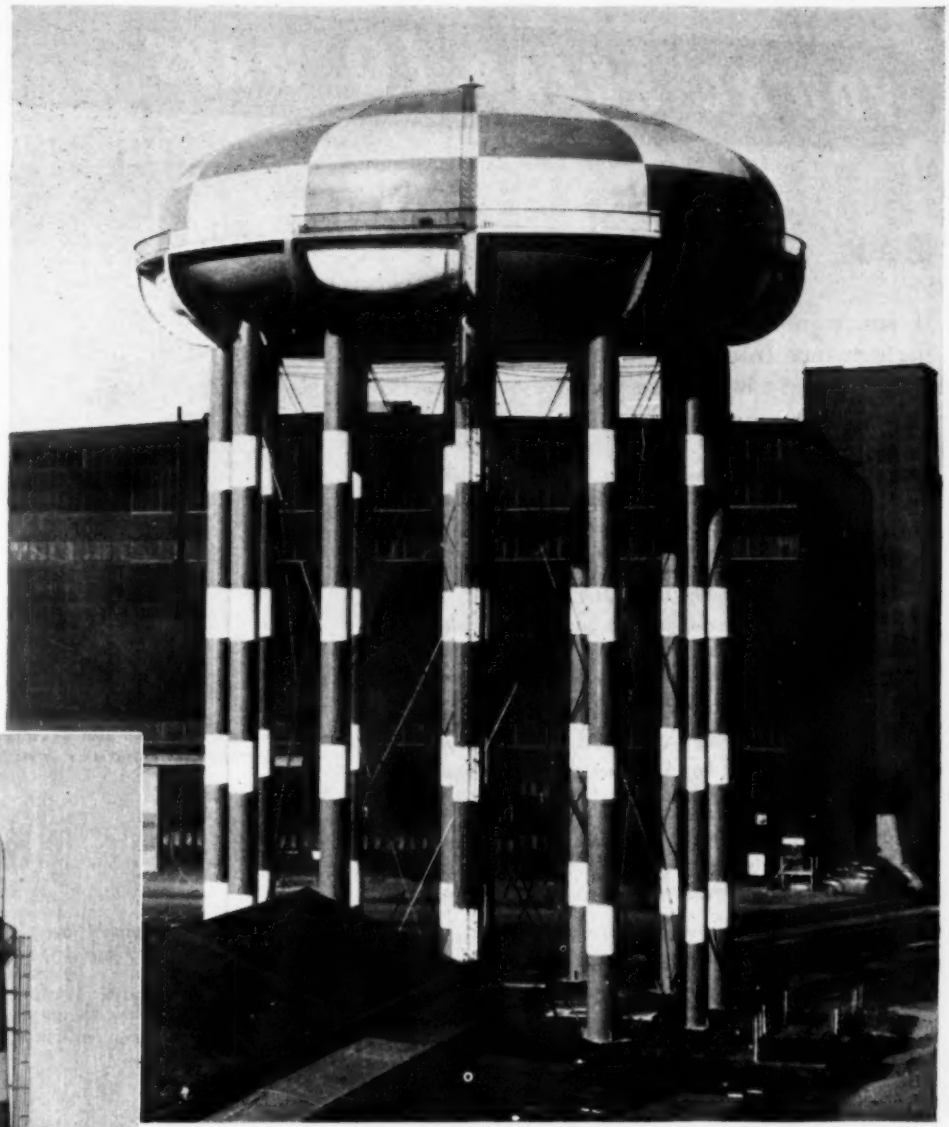
SIMPLEX VALVE & METER COMPANY

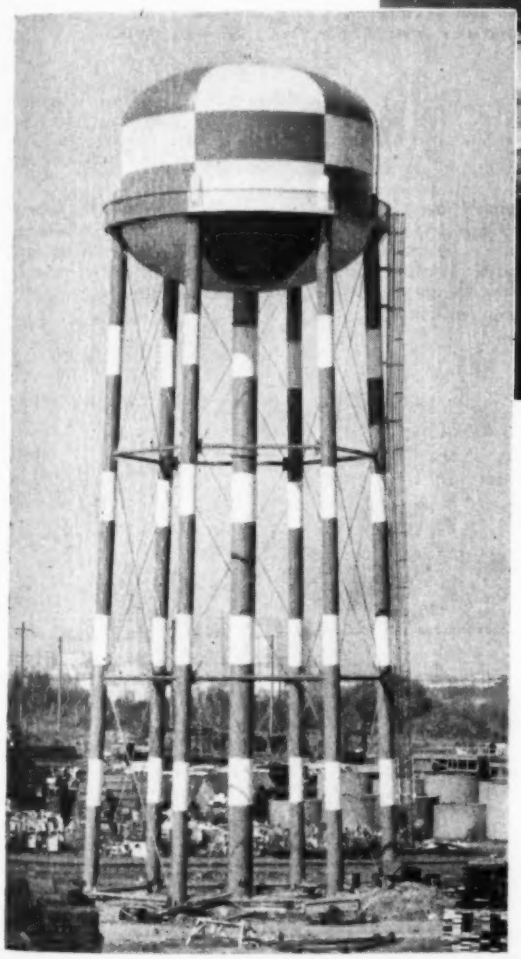
6743 UPLAND STREET, PHILADELPHIA 42, PA.

HORTON

ELEVATED TANKS PROVIDE GRAVITY PRESSURE AT PHILADELPHIA NAVY YARD

The 1,250,000-gal. tank at the right and the 250,000-gal. tank shown below were erected at the Philadelphia Navy Yard to provide gravity pressure in the system supplying potable water for domestic service.





The Philadelphia Navy Yard obtains its water supply from seven deep wells located on the naval base. Water from four of the wells is pumped into a ground-level reservoir, aerated and re-pumped into the distribution system. Two of the wells pump into the distribution through an aerator and iron-removal filters. The seventh well pumps directly into the system. A separate water supply provides fire protection throughout the yard. The sprinkler system in certain buildings, however, is connected to the potable water supply.

The large tank shown above is a Horton radial-cone structure. It has a depth of 25 ft. between the upper and lower water levels while the depth of the tank capacity in the 250,000-gal. tank at the left is 29 ft. The relatively low range in head in both these tanks reduces the variation in pressure as the water is used from them.

Horton elevated tanks are installed in water distribution systems to improve service, to minimize pressure variations or to reduce pumping costs. Write our nearest office for estimating figures.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th St.
Atlanta 3.....2181 Healey Bldg.
Plants in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Dr.
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Havana.....402 Abreu Bldg.
San Francisco 11.....1283-22 Battery Street Bldg.
Detroit 26.....1551 Lafayette Bldg.
In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

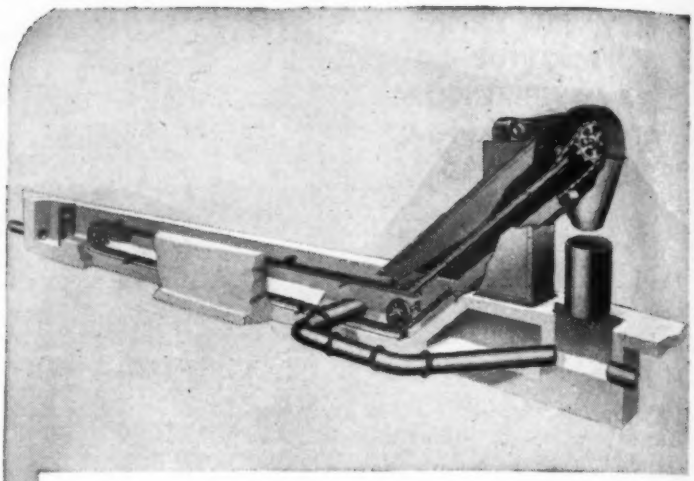
YOU'RE AHEAD 10 WAYS . . .

with Rex Grit Equipment!

If you want efficient, economical, reliable performance from grit equipment, rely on Rex. For only Rex gives you these 10 important advantages:

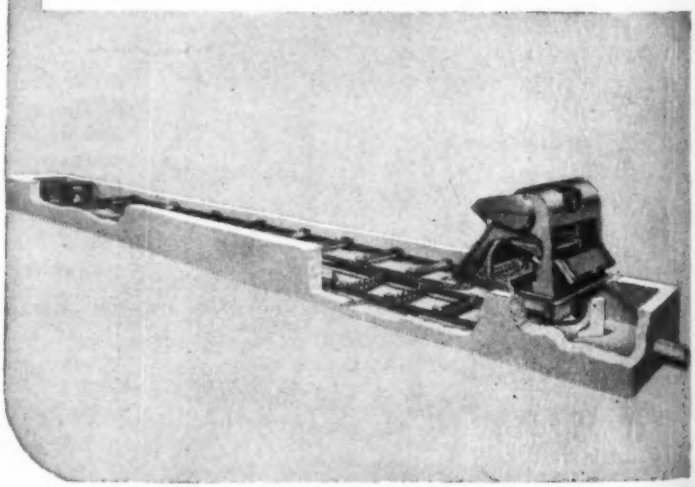
1. *EXPERIENCE. Rex has the knowledge gained from more than 100 units in service providing the experience and background necessary for handling new problems promptly and efficiently.*
2. *LONG LIFE—MINIMUM MAINTENANCE. The exclusive Rex design with quality materials of generous sizes and built-in safety factors, assures long service life with minimum maintenance.*
3. *SIZE AND TYPE FOR ANY JOB. The wide variety of the Rex line assures the right equipment to fit any problem.*
4. *NO GRIT WASHER NEEDED. The recirculation principle of Rex equipment assures effective separation without need for a separate washer.*
5. *RECTANGULAR CHANNELS. Efficient, economical, simple construction with proper control of velocities assured by channel design and control section.*
6. *HIGH CAPACITY. Plenty of power and speed and proper spacing of bucket or flight spacings to handle maximum quantity of grit with minimum operating time.*
7. *Z-METAL CHAIN . . . maximum strength, toughness and corrosive resistant.*
8. *SELF-ALIGNING BEARINGS . . . simple installation, positive alignment, no binding.*
9. *RENEWABLE WEARING SHOES . . . for low maintenance costs.*
10. *NEAT APPEARANCE. Enclosed, streamlined head-sections . . . compact drive units.*

Write Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin, for facts on how you may obtain these 10 important advantages for your jobs.



Rex TYPE MI—for small flows in shallow channels. Suitable for peak flows up to 3,500 g.p.m. Steel scrapers mounted on Rex Z-Metal Chain convey grit along tank bottom and up an inclined deck for delivery into cans or wheelbarrows. Recirculation is effected by replacing can with chute.

Rex TYPE ME—for medium flows in shallow channels—suitable for flows of 14,000 to 17,500 g.p.m. V-Shaped bucket, mounted on Rex Z-Metal Chains, convey the grit along the tank bottom and elevate it to suitable height above the operating floor for discharge into cans. Stirring scrapers are interspersed between buckets to agitate the settled solids. Recirculation is effected by simply opening a slide gate.



REX SANITATION EQUIPMENT
Member of the Water and Sewage Works Manufacturers Association
CHAIN BELT COMPANY of Milwaukee

"We have cut our 'unaccounted-for' water 30% since changing to Badger Meters"

"... and our revenues have shown a marked increase," continues the City Clerk of a well-managed industrial city. "Badger Meters are giving the city uninterrupted service from year to year at a minimum cost."

Millions of satisfied users of Badger Meters in over 5,000 communities prove that "It pays to BUY BADGER."

BADGER METER MFG. CO., MILWAUKEE 10, WIS.

BADGER Water METERS

ACCURACY · LOW COST MAINTENANCE · DURABILITY · SENSITIVENESS

BRANCH OFFICES:

NEW YORK CITY • PHILADELPHIA • WORCESTER, MASS.
SAVANNAH, GA. • CINCINNATI • CHICAGO • KANSAS CITY, MO.
WACO, TEX. • SALT LAKE CITY, UTAH • PORTLAND, ORE. • SEATTLE, WASH. • LOS ANGELES

57,000,000 Barrels

Turbines . . . other power generation equipment.

Transformers — all types and sizes 1½ kva and up.

Unit substations — available in any practical size.

Motors 1 hp and up; controls; V-belt drives.

ALLIS

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

One of the Big 3 in Electric Power Equipment

s of Oil...F.O.B. Tulsa!

Allis-Chalmers Pumps and Motors Used to Supply City with Mountain Spring Water

TULSA . . . COLOSSUS OF OIL . . . world leader in oil production . . . center of petroleum geophysical and technological research. But oil is not all of Tulsa's fame—there are lovely homes on quiet streets, and a traditional manner of living that adds up to a friendly, pleasant city.

* * *

Lake Spavinaw, lying 60 miles northeast in the Ozarks, is Tulsa's water source. To carry the water to users, Tulsa has installed much Allis-Chalmers equipment. The pumps and motors shown here have delivered dependable performance since being installed in 1931. This is the kind of equipment reliability that all cities—large, medium and small—can expect from Allis-Chalmers. For complete information send for Public Works Bulletin 25B6607 or call your nearest A-C office. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

HERE is the Allis-Chalmers equipment that has served Tulsa so well. Pumps are Type LS, 20 by 18 in. with a capacity of 12 mgd and heads of 20 ft. Motors are Type ARY, 50 hp, 495 rpm. A 2311

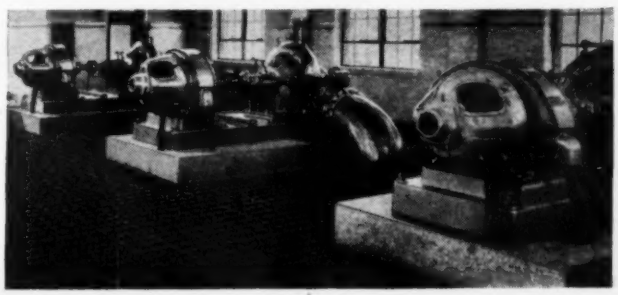
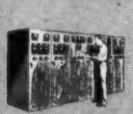


Photo Courtesy Tulsa Chamber Commerce, Copyrighted Bob McCormack, Tulsa

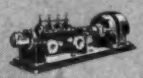
CHALMERS

Biggest of All in Range of Industrial Products!



Switchgear; power distribution equipment.

Blowers, compressors in most sizes to fit all jobs.



Centrifugal pumps; types, sizes to 160,000 gpm.

A LIFE HISTORY OF CAST

More than 96 per cent of all cast iron mains in sizes 6 inch and over, that have ever been laid in these cities, are still in service.

A STUDY of "Survival and Retirement Experience With Water Works Facilities" in 25 cities has recently been completed. The facilities studied included cast iron distribution mains.

The 25 cities, with a total population of nearly 7 million, have installed more than 55 million feet of cast iron mains. The first of these mains was laid in 1817.

A report recently published by the American Water Works Association* includes individual tables for each city showing in detail the amount of cast iron pipe laid by sizes, the amount still in service, and the year of the first installation.

A combined tabulation of the 25 tables reveals a remarkable experience with cast iron distribution mains. In these 25 cities, more than 96 per cent of all cast iron mains in sizes 6 inch and over, that have ever been laid are still in service.

Nearly 2 million feet of cement-lined cast

*Available from American Water Works Association, 500 Fifth Ave., New York.

CAST IRON PIPE

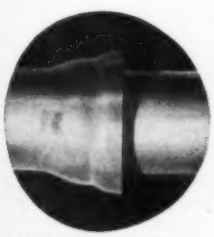
IRON PIPE IN 25 CITIES

iron pipe has been installed by 16 of the 25 cities over a period of 20 years. More than 99 per cent of these mains are still in service.

With the permission of the A.W.W.A. we have reprinted the facts as they apply to cast iron pipe in a brochure "Survival and Retirement Experience With Cast Iron Water Mains." If you have not received a copy, write us.

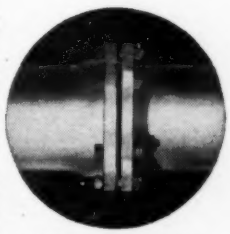
"Cast iron pipe not only offers a century or more of efficient life as a structure—it offers a century or more of efficient life as a carrier. In the limited areas with tuberculating waters, cement-lined cast iron pipe is tuberculation-proof and insures high carrying capacity for the life of the pipe. In the greatly predominating areas without tuberculating waters, the carrying capacity of unlined cast iron pipe remains practically unimpaired for the life of the pipe."

Joints for Cast Iron Pipe



Bell-and-Spigot Joint: the standard joint for water and sewerage service.

A variety of joints are available, of which the two most widely used are illustrated. Special purpose joints such as the Ball-and-Socket, or Flexible Joint for underwater use, and the Flanged Joint for above-ground use, are also available.



Mechanical Joint: bottle-tight and flexible, now with interchangeable parts.

"SILENT SERVICE is not enough"—A.W.W.A.

The American Water Works Association is recommending to its members, for local action, a sound, well-planned program of Public Relations publicity and advertising. It is based on the premise that good water service, like good health, is too often taken for granted, in which case favorable public opinion is dormant.

To co-operate with this program and help to arouse national recognition of the efficient service rendered by America's water supply systems, the Cast Iron Pipe Research Association is presenting little known facts about public water supply to the *six million* readers of "Time" and "Nation's Business" throughout 1947.

For example, the following human-interest cartoon and excerpts from a current advertisement

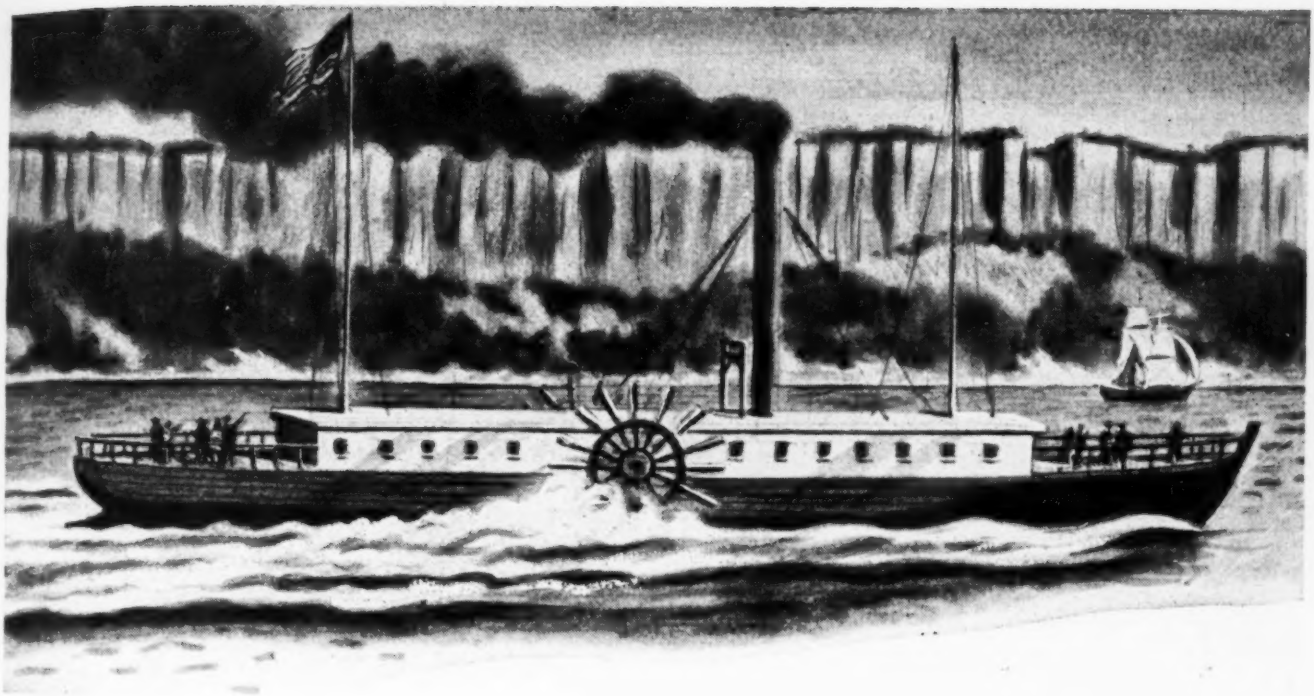
the bucket brigade

In great-grandfather's time, when public water supply systems were few and far between, a house on fire was a real threat to the community. Today, in 13,000 communities, public water supply systems provide sufficient water to control fires in addition to supplying home and industrial needs. A thousand gallons a minute from modern firefighting equipment may be unfair to bucket brigades but is mighty comforting to property owners.

Because it is dependable and long-lived, cast iron pipe is the standard material for underground mains supplying water for fire protection as well as domestic needs.

Remember that your public water supply system not only protects your property but guards your health by providing safe, palatable water—and for less than a dime a ton. Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 So. Michigan Avenue, Chicago 3, Illinois.

SERVES FOR CENTURIES



... and they said, "She'll never turn a wheel"

Skeptics of the early 19th Century made one notably poor prophecy. "She"—the Clermont—did turn a wheel. And in short time, thousands of people were traveling in comfort by steamboat.

One of the reasons for the rapid success of important inventions such as the steamboat is that they were designed and engineered from the start for a single purpose—to do a better job.

Transite Pressure Pipe is a more recent example of the same sound principle. It too was designed and engineered from the very start for a single purpose—to do a better job.

J-M engineers combined asbestos and cement by a special process, produced a material which they called Transite. Transite Pressure Pipe is strong, rustproof, resists even the most corrosive soils . . . has a high-flow capacity which can never be reduced by tuberculation.

Then a coupling made of Transite was designed and named the Simplex Coupling. Simple and effective, it consists only of a Transite sleeve and two rubber rings tightly compressed into position between sleeve and pipe. This construction guards against leakage and also provides flexibility at each joint. The flexibility helps to cushion the entire line against shock and soil stresses, permits a deflection up to 5 degrees at each joint.

In short, the same kind of engineering foresight and planning that produced the steamboat, the automobile . . . and similar developments which have contributed to industrial progress . . . has been applied to the field of water transportation.

Transite Pressure Pipe was designed and engineered from the start for one single purpose—to carry water more efficiently.

For all the facts about Transite Pressure Pipe, write Johns-Manville, Box 290, New York 16, New York. Ask for Brochure TR-11A.

JOHNS-MANVILLE JM PRODUCTS

Crane Valves do more than control flow

A SUBURBAN VILLAGE *waterworks equips with Crane. Shown are Crane 10-in. gear and chain wheel operated gate valves on high lift pumps.*

A. W. W. A. GATE VALVES BY CRANE *are assurance of complete compliance with newest specifications, and of the best valve performance in their class. Pattern No. 2495, illustrated, double disc, outside screw and yoke, flanged ends, comes in 2 to 24-in. sizes. See Crane Catalog supplement 3A, page 126.*

In water and sewage plants the country over, Crane valves do more than just stop and start flow. By doing that job precisely, they safeguard public health. By giving unusually long and faithful service, they hold valve maintenance, repair and replacement costs to the lowest level.

To the men responsible for public water services, Crane valves assure peace of mind under all working conditions. Wouldn't you feel safer with valves and fittings having a reputation for dependability through more than 90 years?

CRANE CO., General Offices: 836 S. Michigan Avenue, Chicago 5, Illinois. *Nationwide Service Through Branches and Wholesalers.*

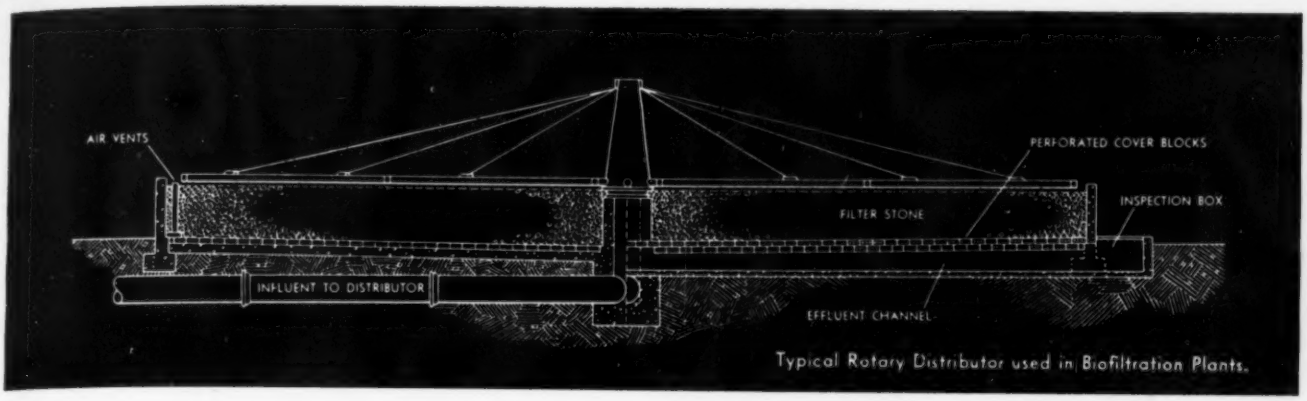
A LARGE CITY *pumping station specifies Crane quality valves—gates, globes, angles, checks—from the smallest to the 36-in. motor-operated control valves to mains.*

VALVES · FITTINGS · PIPE

CRANE

PLUMBING AND HEATING

ECONOMICAL SECONDARY TREATMENT



Typical Rotary Distributor used in Biofiltration Plants.

Jeffrey Equipped
BIOFILTRATION SYSTEMS

(Patented)

Plants like these offer an economical solution of secondary treatment problems. Biofiltration has the following advantages:

1. **Lower first cost of filters, as depth is only 3 to 4 feet and volume of stone usually about 20% of that in standard low rate filters.**

2. **Control of recirculation rates makes it possible to produce an effluent to meet varying requirements of the receiving water course.**

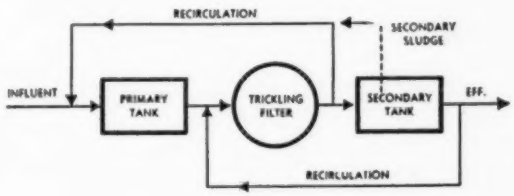
3. **Automatic control of recirculation, makes possible less operating personnel than required in most secondary processes.**

4. **Constant application to filter eliminates fly and odor nuisance.**

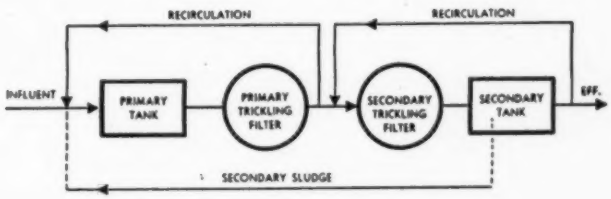
Single stage complete treatment plants (see drawing below) will give overall B.O.D. removals of better than 85%. Two stage complete treatment plants will give overall B.O.D. reductions of better than 90%.

Roughing filters, either with or without recirculation, can take enormous loadings with appreciable reduction in B.O.D. Such filters may be the solution to present overloaded secondary processes.

Submit your problem to our sanitary engineers, who are qualified to give you economical solutions to your problem.



SINGLE STAGE PLANT



TWO STAGE PLANT

JEFFREY ESTABLISHED 1877

New Michigan water line uses 78 miles of CONCRETE PIPE

Laying 48″ concrete pipe near Saganing.

36″ concrete pipe distributed along proposed line.

TO get a pure, palatable and adequate supply of water, Saginaw and Midland, Michigan, are constructing a 78-mile water line of 48″, 36″ and 24″ reinforced concrete high pressure pipe around Saginaw Bay to Whitestone Point. From there the line extends two miles out into Lake Huron to the intake crib.

A pumping station at Whitestone Point will provide a 300-ft. head. A second one at Bay City, where the line divides to Saginaw and Midland, will maintain a 150-ft. head. The two cities now use 21½ million gallons of water daily. New line and stations will be able to supply 43 million gallons daily and additional pumping facilities can raise this to 70 million gallons should need arise.

L. W. Wells Construction Co., Bass Engineering & Construction Co., Chas. F. Smith & Sons, Inc., Lock Joint Pipe Co., and Price Bros. Co., are the contractors. Alvord, Burdick and Howson are the consulting engineers.

Whether you are planning a long water line like the Saginaw-Midland project or a small local community or industrial job, concrete pipe offers long life and economy. Its hydraulic capacity is not impaired by incrustation. Concrete pipe provides great structural strength and high wear resistance to abrasion.

PORTLAND CEMENT ASSOCIATION

Dept. A10-29, 33 West Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

PENN SALT

Liquid Chlorine

CHLORINE has come to be a "standard" chemical for water purification. In addition, under certain circumstances it tends to stabilize sludge, control taste and odors, aid precipitation, prolong disinfecting action.

Chlorine is also the most generally used agent for controlling odors of sewage. It also aids in the prevention of sewer and manhole disintegration.

Pennsalt was a pioneer in liquid chlorine production in this country, and for nearly half a century has supplied high quality chlorine to industry.

PENNSALT PRODUCTS

for Water Sanitation Treatment and Sewage Treatment: Liquid Chlorine • Perchloron* • Anhydrous Ammonia • Filter Alum • Ferric Chloride • Sodium Aluminate • Quaker Improved Chlorinated Lime • Caustic Soda.

*Reg. U. S. Pat. Off.

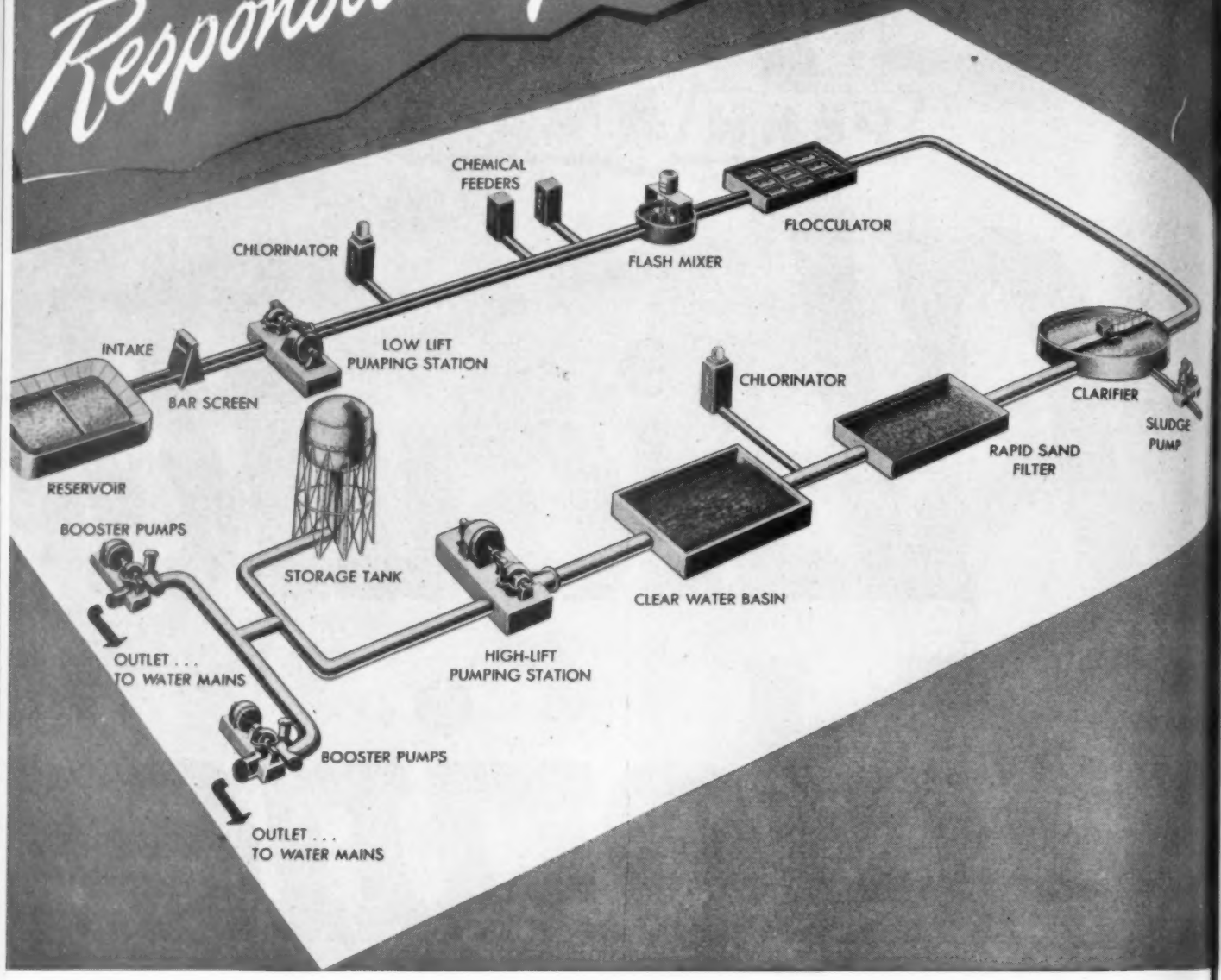
PENNSYLVANIA SALT MANUFACTURING COMPANY

1000 Widener Building, Philadelphia 7, Pa.

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • CINCINNATI • WYANDOTTE • TACOMA • PORTLAND, ORE.

Unit Responsibility

KEY TO MORE



"A TO Z" SOLUTION TO YOUR ELECTRICAL OR POWER REQUIREMENTS . . . *FOR HIGHER OPERATING EFFICIENCY*

Whether your plans call for expansion, modernization or a completely new plant, you will find advantages in using the Westinghouse background in waterworks engineering—regardless of the size of the contemplated project.

Westinghouse engineers will work with you to obtain highest operating efficiency through the proper *selection, application* and *co-ordination* of the complete electrical drive.

Westinghouse equipment will provide you assurance of long-time, trouble-free service.

Westinghouse servicing will minimize and simplify your maintenance problems.

Typical of case histories where Westinghouse waterworks engineering has been job-proved is the City of Dallas 120 mgd Bachman plant, which is completely Westinghouse-electrified.

For help on your waterworks drive problem, call your Westinghouse office, or write today to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94746

E OPERATING EFFICIENCY

"WESTINGHOUSE-EQUIPPED THROUGHOUT" MEANS SIMPLIFIED ORDERING, QUICKER INSTALLATION, MORE EFFICIENT OPERATION

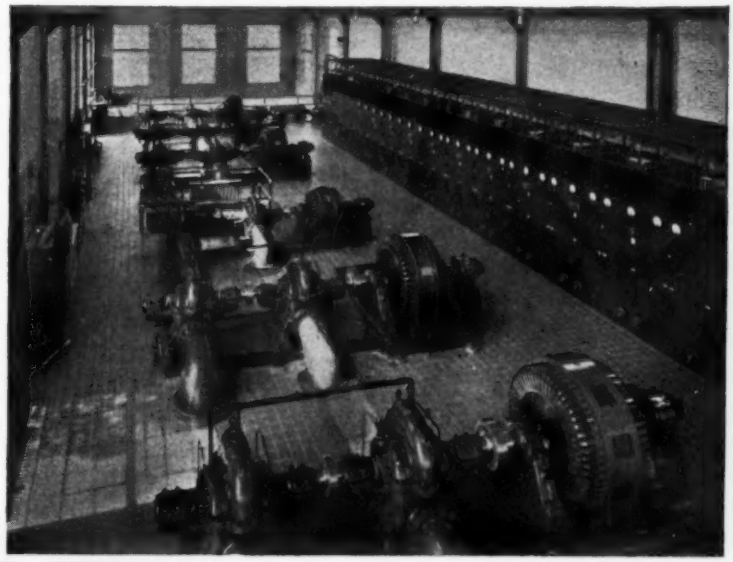
Putting power to work *efficiently* can be a major problem—or a simple one. When items must be selected, ordered and received from many sources, it means many chances for costly errors and delays . . . divided responsibility—or none at all—for performance of installed equipment.

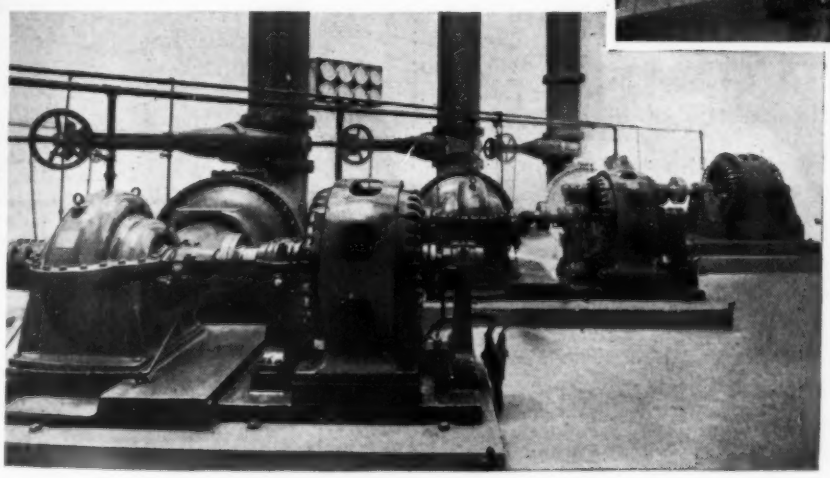
Westinghouse offers the way to simplify the job. From equipment for generation of electrical or steam power, to the most specialized types of drives and control for its utilization, Westinghouse provides a single source of supply . . . one broad pair of shoulders competent to take responsibility for performance of all parts of the job.

Here is one of many examples where Westinghouse unit responsibility is preventing headaches . . . saving money . . . assuring *higher operating* efficiency:

MAIN PUMPING FLOOR of the 120 mgd Bachman Waterworks, City of Dallas, Texas. This plant has 15,225 hp in Westinghouse motors, supplemented by Westinghouse switchgear and other apparatus. The satisfactory service rendered is evidenced by 12 years' operation without repairs of any kind to electrical equipment, with a maintenance cost which has averaged less than 2c per hp.

In the center are five 800-hp and one 400-hp Westinghouse synchronous motors. At the left and right-rear two Westinghouse motor generator sets (one of which is a standby unit) furnish excitation for four 500-hp and three 900-hp Westinghouse motors located in the basement. At the right is shown part of the Westinghouse controls for the entire plant.





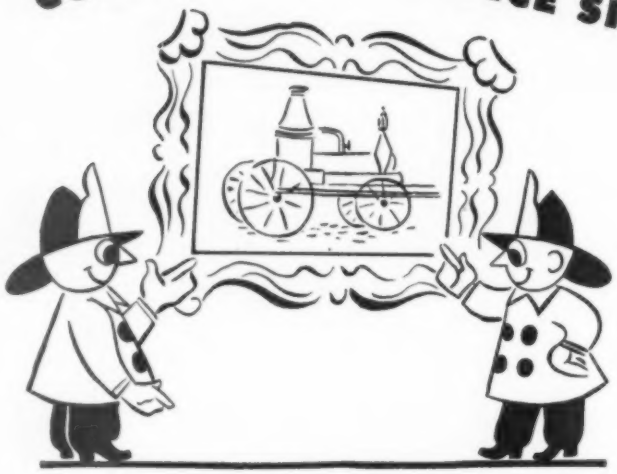
LEFT: Basement floor, showing three of four 500-hp Westinghouse motors, each of which drive a 30 mgd raw-water pump. Three 900-hp Westinghouse vertical motors, driving clear-water pumps, are also located on this floor but are not seen in this picture.

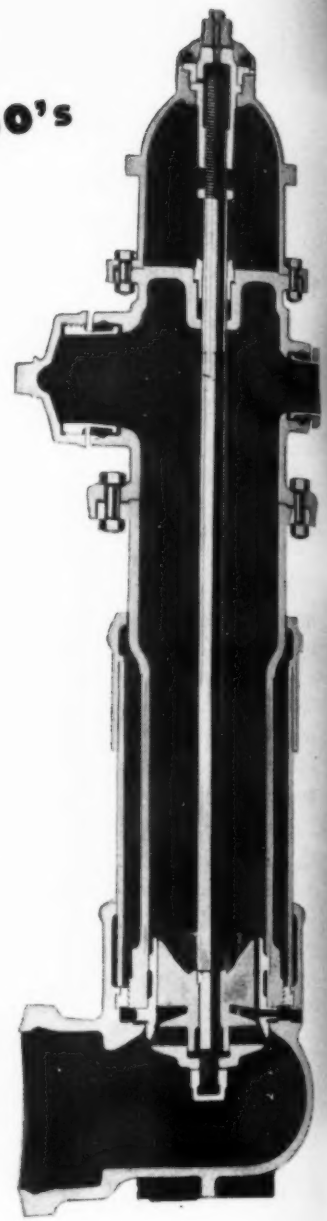
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MORE PRODUCTIVE POWER FOR INDUSTRY

CONTINUOUS SERVICE SINCE THE 1800's





Thousands of Mathews Hydrants have been in continuous service for three quarters of a century. It's the way they're built.

Take the valve assembly, for example. The drain valve, positive and automatic, is an integral part of the guide and the upper main-valve plate. Keyed to the hydrant stem, it moves vertically with the main valve. As the main valve opens, the drain valve closes the orifice, and vice versa. The main valve, true compression type, opens *against,* and closes *with,* the pressure; there is no strain, no leakage—even if the hydrant should be broken in traffic. The assembly being cone-shaped, the water can be turned on or off gradually—no water hammer, minimum friction, minimum deposit of sediment on the valve seat.

Mathews have long been the leading hydrant the world over. Insist that your community have the extra protection of this famous make.

OTHER FEATURES OF MATHEWS LEADERSHIP

Head can be rotated a full circle, on swivel flange • Replaceable head permits change in nozzle outlets • Nozzle levels can be raised or lowered without excavating • Barrel screws into bronze bushing in elbow • Operating thread (easily accessible) is only part that needs oiling • Stuffing box plate cast integral with the nozzle • Shield operating nut keeps out dust, rain, sleet • Maintenance and repair expense kept to the minimum.

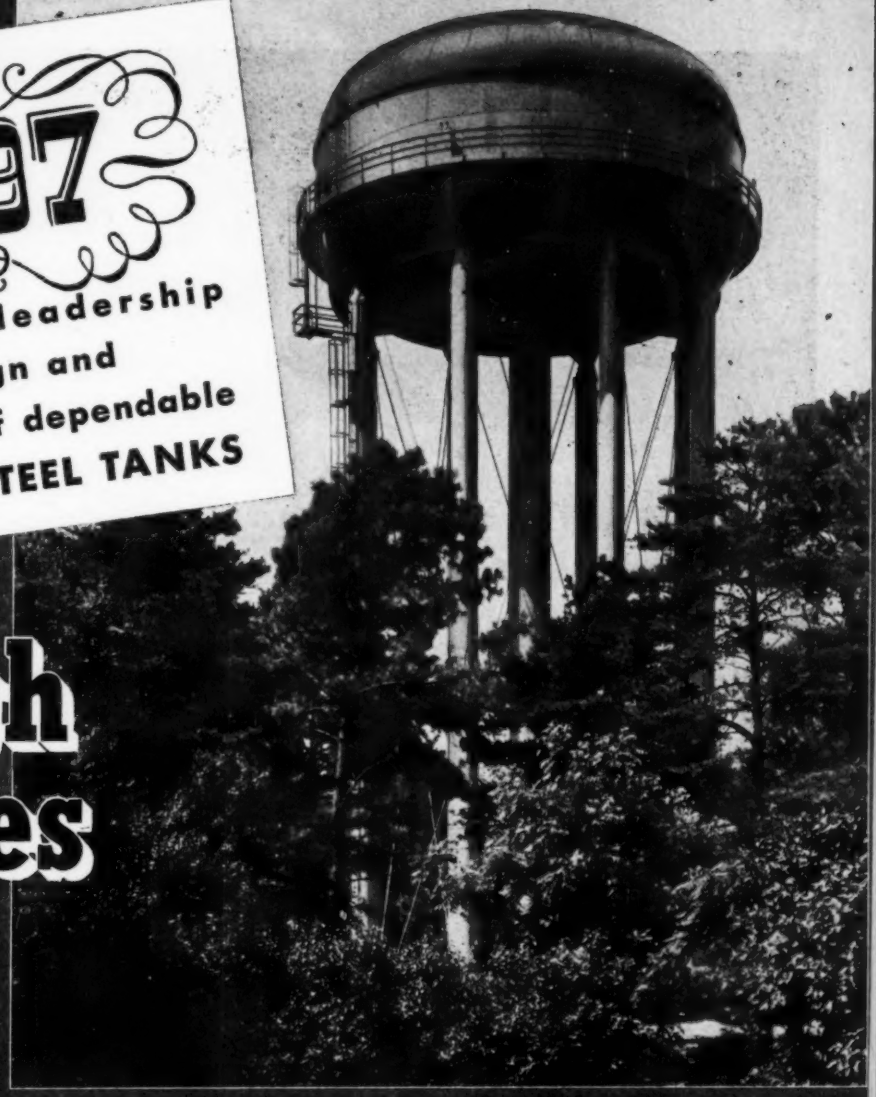
MATHEWS HYDRANTS

Made by **R. D. WOOD COMPANY**

PUBLIC LEDGER BUILDING, INDEPENDENCE SQUARE, PHILADELPHIA 5, PA.

MANUFACTURERS OF "SAND-SPUN" PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

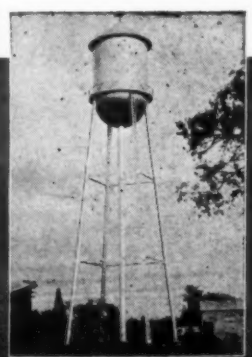
SINCE
1897
50 Years of leadership
in design and
construction of dependable
ELEVATED STEEL TANKS

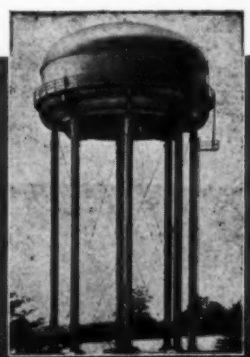


Pittsburgh Des·Moines

The first elevated steel tank erected by Pittsburgh-Des Moines Steel Company a half-century ago is still on the job today . . . a witness to original P.DM design and craftsmanship. The steady development of specialized elevated steel tank engineering, fabrication and erection by this organization through the years is attested by the thousands of dependable P.DM Tanks serving municipalities and industries throughout America and in several foreign countries. *May we consult on your particular requirements?*

DOUBLE-ELLIPSOIDAL





PITTSBURGH • DES MOINES STEEL CO.

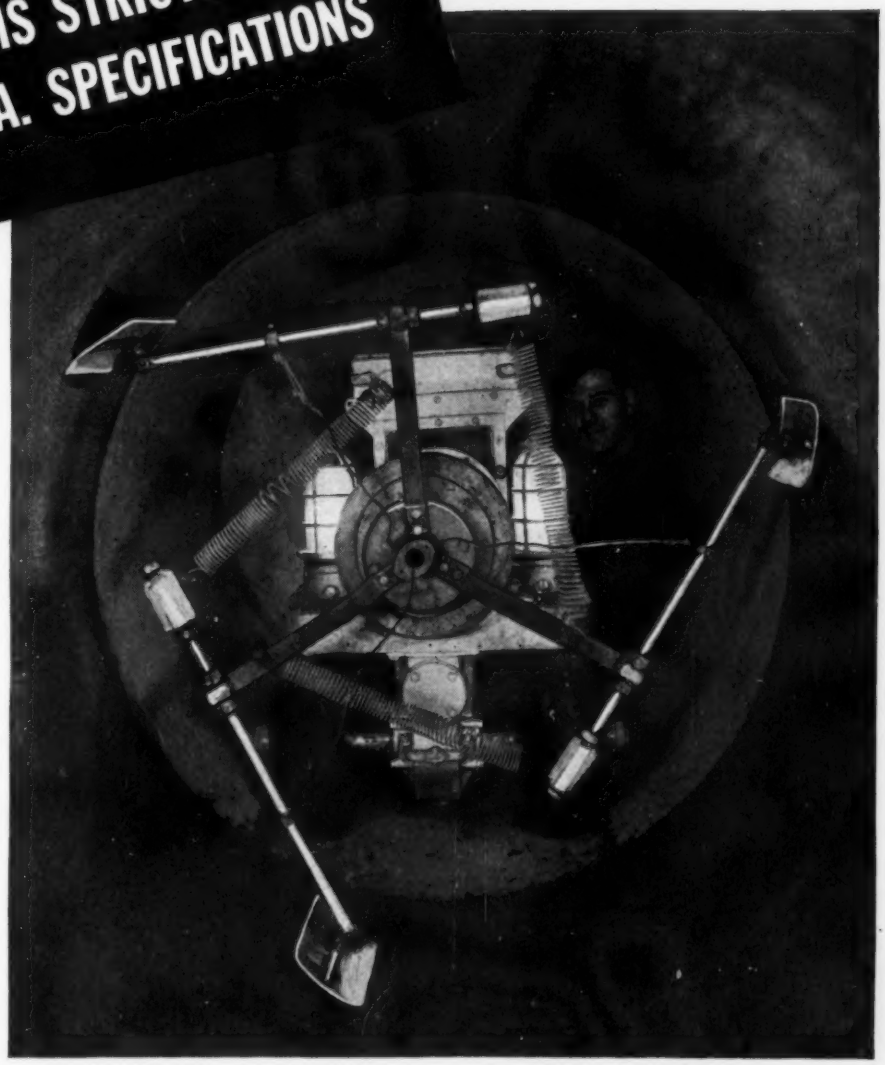
PITTSBURGH, PA. 3418 NEVILLE ISLAND — DES MOINES, IOWA, 818 TUTTLE STREET
NEW YORK, ROOM 918, 270 BROADWAY • CHICAGO, 1222 FIRST NATIONAL BANK BUILDING
DALLAS, 1223 PRAETORIAN BUILDING • SAN FRANCISCO, 625 RIALTO BUILDING

FAIRBANKS MORSE
SALES
POMONA PUMPS
SERVICE
F-M Centrifugal Pumps: Double-suction, side-suction, multi-stage, angle-flow, vertical—all types, modifications and sizes
WHAT MAKES A GOOD PUMP DEALER?
A pump dealer is as good as the line he sells, and the facilities he maintains for servicing his customers' pumps.
You look to a good dealer for a broad line of pumps—with so many types and sizes that he can give you unprejudiced advice . . .
You look to a good dealer for the benefits of a service organization that's ready and able to solve your pumping problems at the drop of a hat . . .
That's why so many pump buyers think of their Fairbanks-Morse dealers as the best in the business.
Westco Turbine Pumps: Precision-built, with renewable liners: for high head pumping of wide variety of liquids
F-M Rotary Pumps: Simple, low cost units for general, wide application. Sizes from 3/8" to 5"
F-M Pomona Deepwell Turbines: Oil or water-lubricated: with open or closed impellers, as your job requires
F-M Propeller Pumps: For large capacity low head service
FAIRBANKS-MORSE
A name worth remembering
DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

CENTRILINE

CONFORMS STRICTLY WITH A.W.W.A. SPECIFICATIONS

▶▶▶ PIPE LINING FACTS NO. 3



▶▶▶▶ The Standard Specifications for cement-mortar protective coatings issued by the American Water Works Association provide: "Interior of the entire line, including both curves and tangents, shall be by centrifugal machine . . . the machine shall apply the mortar by centrifugal action without the use of compressed air and follow its application by automatic trowelling to a uniform thickness and smooth finished surface."

The strict adherence to these specifications by Centriline insures a continuous, dense, smooth lining, applied without rebound that means restored carrying capacity perpetually sustained and longer life to mains. If pipelines are losing efficiency it is time to consider Centrilining. Our engineers stand ready to assist you.

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CENTRILINE CORPORATION

148 CEDAR STREET · NEW YORK 6, N. Y.

CEMENT MORTAR LININGS FOR WATER MAINS

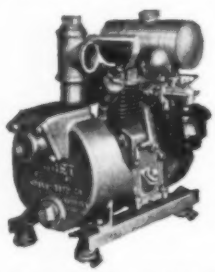
Centrifugally Applied

In Strict Conformity with A. W. W. A. Specifications

NEW SANITARY CLEANER MEETS PUBLIC HEALTH STANDARDS

"HANDY" PUMP

A tiny pump weighing only 20 lbs., remarkable for performance. Fitted with pipe or common garden hose, this pump will lift up to 25 ft. Delivers 8 GPM at 40 lbs. pressure. Electric motor driven – self-priming. An extremely handy, dependable and trouble-free pump for all kinds of pumping jobs.



"MIDGET" PUMP

The ideal, lightweight, self-priming pump. Easily handled – weighs only 60 lbs. Will pump 3000 GPH at 20 ft. head, 5 ft. suction lift. Rapid automatic priming. Husky – trouble free – non-clogging. Whatever your pumping requirements may be up to 125,000 GPH there is a Gorman-Rupp Blue pump to do the job quicker and better.

HERE'S A GOOD BUSINESS FOR SOMEONE IN YOUR TOWN!

Public Health Officials - Show this Announcement to Sanitary Service Operators in Your Community!

The New Odorless Sanitary Cleaner is modern apparatus for cleaning septic tanks, vaults and cisterns. It is complete in every respect. It is shipped ready to mount on standard truck chassis, 158 to 161 inches length. It is built by the Gorman-Rupp Company, a leader in the pump industry.

This O. S. C. unit is approved by public health officials because it eliminates old-style, makeshift equipment – often open tanks, diaphragm hand pumps and even shovels. With an O. S. C., cleaning the septic tank is as casual and efficient as any other household service.

The O. S. C. has a powerful Gorman-Rupp Centrifugal Sewage Pump of self-priming design. Septic tanks of 500 gallon size are cleaned in 15 minutes; 1,000 gallon size in 20 minutes. A 25,000 gallon septic tank was cleaned in just 10 hours.

It's water-tight, fly-proof and entirely enclosed. A boon to operators now in business. A real opportunity for the veteran wanting his own business. Buy an O. S. C. unit under the G. I. Bill of Rights.

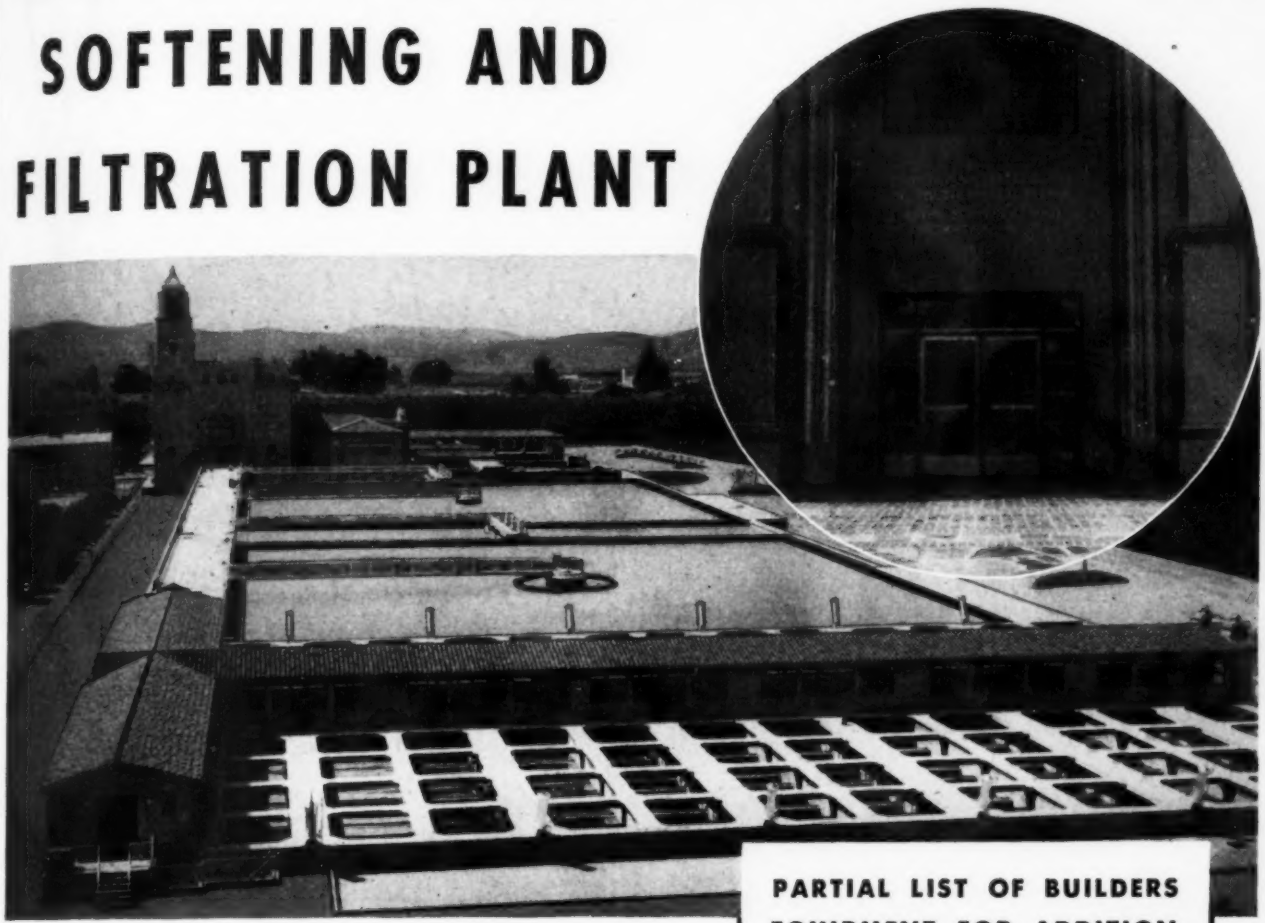
For further information and descriptive literature write

THE GORMAN-RUPP COMPANY

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST

323 N. Bowman St. **Mansfield, Ohio**

BUILDERS AGAIN AT THE LA VERNE SOFTENING AND FILTRATION PLANT



The Metropolitan Water District of Southern California in doubling the capacity of its water softening and filtration plant at LaVerne, California, opens its doors again to Builders Equipment. The new 100 m.g.d. addition, like the original plant, will have Builders Gauges, Controllers, Diaphragm Pendulum Units, and Master Controls.

Bringing water from the Colorado River and distributing it to the district member cities has been one of the world's great engineering accomplishments. It is a tribute to the performance of the original equipment on this great project that Builders Equipment is again specified . . . no better recognition of quality and dependability could be awarded any product. Through the years an ever-increasing volume of repeat business has come to Builders from satisfied customers.

For Bulletins describing Builders Equipment address Builders-Providence, Inc. (Division of Builders Iron Foundry) 10 Codding St., Providence 1, R. I.

PARTIAL LIST OF BUILDERS EQUIPMENT FOR ADDITION AT LaVERNE, CALIFORNIA

- **24 Model RCB Rate Controllers, 20" and 24"**
- **24 Diaphragm Pendulum Pilot Valve Units**
- **24 Recording Gauges with strip charts**
- **12 Loss of Head Air Operated Transmitters**
- **24 Rate of Flow Air Operated Transmitters**
- **2 Master Controls (grouped in sixes)**
- **1 Twelve-Unit Air Summator**
- **1 Special Summation Unit**

(All Instruments are Air Operated)

BUILDERS PRODUCTS

Venturi, Propelofio and Orifice Meters • Type M and Flo-Watch Instruments • Venturi Filter Controllers and Gauges • Master Controllers • Wheeler Filter Bottoms • Filter Operating Tables • Kennison Nozzles • Manometers • Chronoflo Telemeters • Conveyoflo Meters

BUILDERS PROVIDENCE *Instruments*

APPROVED!.....

THE PACE SETTER SINCE 1928

"VAREC" *approved* VENT EQUIPMENT

is listed by:
The Underwriters' Laboratories for use on Oil Storage Tanks.

Approved by:
Associated Factory Mutuals' Laboratories
U. S. Treasury Department
U. S. Coast Guard
American Bureau of Shipping
Lloyd's Register
U. S. Navy
U. S. Army Engineers
Depending upon which is the governing authority

Approved venting equipment pays off . . . Minimum insurance rates are extended! Oxidation effects are reduced and fire prevention is enhanced.

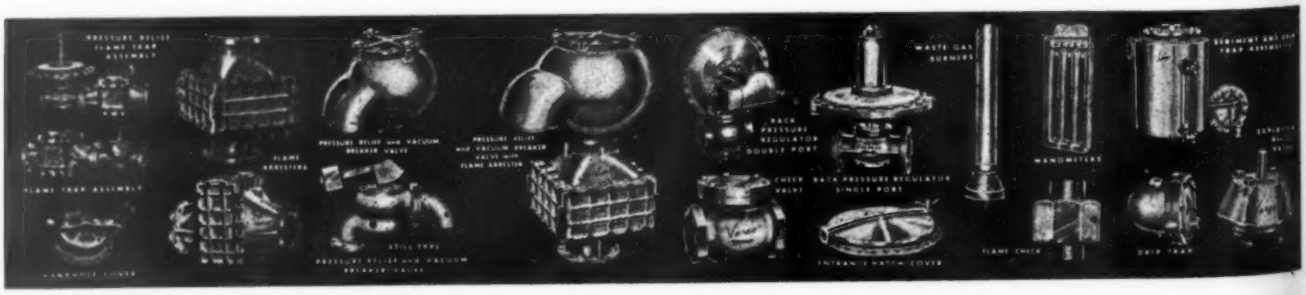
"VAREC" *Approved* Venting Equipment serves economically and safely wherever corrosive, toxic and combustible fluids are stored. Equipment design allows proper functioning under the *most adverse* climatic conditions. Modern engineering, proved materials for specific services and thorough testing insures complete trouble-free operation.

When "laying-out" a Sewage disposal plant designate "VAREC" *Approved* Gas Control Equipment. Specifications of individual units are listed in the latest "VAREC" Catalog No. S-3. Write for a copy on your letterhead today.

THE VAPOR RECOVERY SYSTEMS COMPANY
COMPTON — CALIFORNIA — U.S.A.

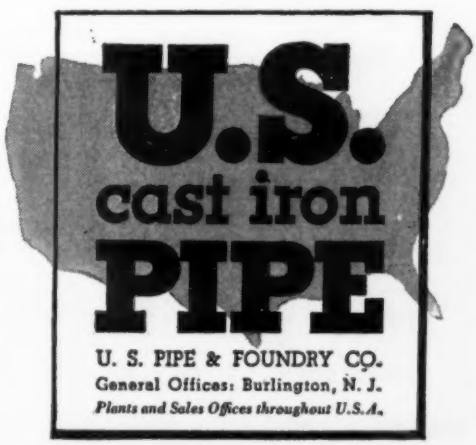
NEW YORK, N. Y. — CHICAGO, ILL. — CLEVELAND, O. — HOUSTON, TEX. — TULSA, OKLA.
Agencies Everywhere, Cable Address VAREC COMPTON—(All Codes)

174

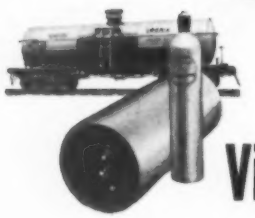


Original Woodcut by Lynd Ward

October is the month when many farmers can take a deep breath and relax a bit. Not so in a pipe foundry. We must continue month after month to maintain our rigid quality controls from raw materials to the final test on the finished products. These products, cast iron pipe and fittings, are being constantly produced and shipped to all parts of the country by our plants to meet the urgent needs for water, gas and sewerage service.



For *Improved* Palatability of Drinking Water . . .



Virginia "Esotoo"

is the preferred dechlor . . .

"Virginia" Esotoo provides the accurate control of residual chlorine which is an essential to palatability in municipal water-supply. Managers and plant engineers in increasing numbers recognize the value of SO_2 for the effective control of dechlorination in their filter-plants. The "Virginia" technical staff will cooperate with you to the fullest in solving your dechlor problems. Write for further information. VIRGINIA SMELTING COMPANY, West Norfolk, Virginia. *Established 1898.*

VIRGINIA *Chemicals*

WEST NORFOLK • NEW YORK • BOSTON • DETROIT

Floatless all Electric

LIQUID LEVEL CONTROLS

● All America knows about B/W Controls for liquids—no floats, no vacuum tubes—no moving parts in the liquid.

These controls are but part of B/W service to industry, for we also manufacture other controls, such as high and low water cut-offs and signals, low voltage control for motor starters, unit heater controls and many others. They are small enough to hold in the palm of your hand.

CATALOG 147 tells all about them and suggests many other applications where dependability, long life and safety are "musts."

B/W CONTROLLER CORPORATION

2206 E. Maple Road, Birmingham, Mich.

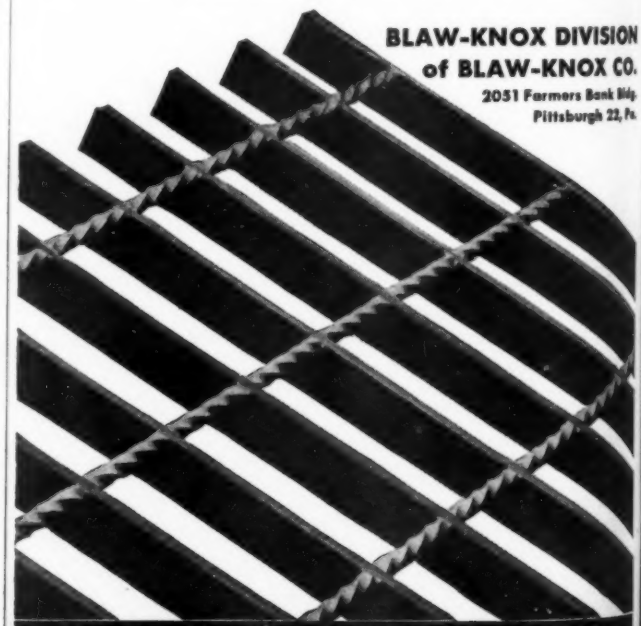
FIRST IN THE FLOATLESS CONTROL FIELD

5 GOOD REASONS

for buying Blaw-Knox Grating . . . COUNT 'EM!

1. STRONG electroforged construction for easy erection.
2. MAXIMUM OPEN AREA for light and air.
3. EASY TO MAINTAIN . . . paint reaches entire surface.
4. SELF-CLEANING, no sharp corners to clog.
5. SAFE footing at all times with twisted cross bar.

BLAW-KNOX DIVISION of BLAW-KNOX CO.
2051 Farmers Bank Bldg.
Pittsburgh 22, Pa.



BLAW-KNOX ELECTROFORGED STEEL **GRATING**

DE LAVAL
Compressors for Sewage Plant Service

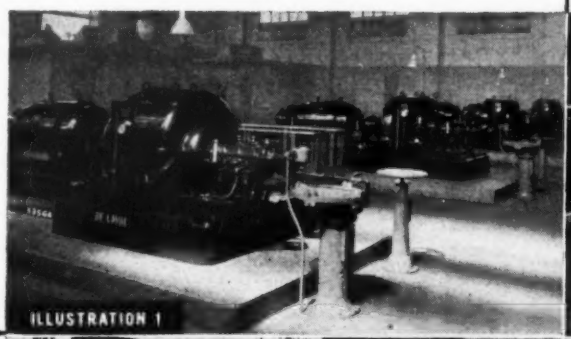


ILLUSTRATION 1

ILLUSTRATION 2

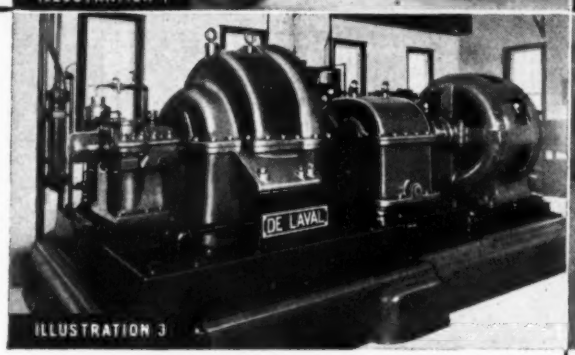


ILLUSTRATION 3

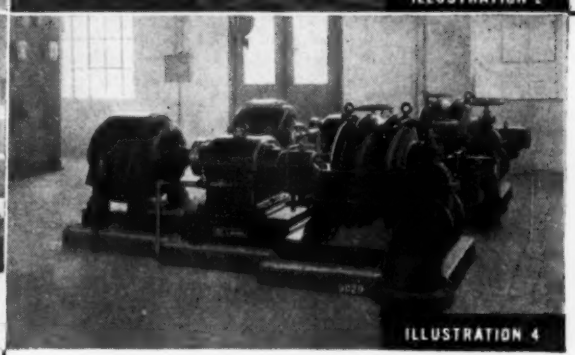


ILLUSTRATION 4

1. FOUR DE LAVAL COMPRESSORS OF 10,000 CFM CAPACITY AT 7 PSI installed at the Bowery Bay Sewage Treatment Plant, New York, N. Y.

2. DE LAVAL COMPRESSORS AT CLEVELAND. Two are rated at 40,000 cfm against 7.4 lb. gage at 3560 rpm and two at 25,000 cfm.

3. TWO-STAGE COMPRESSOR in activated sludge disposal plant at Houston, Texas. This unit has been in service for more than 19 years, operating 99% of the time.

4. TWO DE LAVAL GEARED TURBINE COMPRESSORS supplying 3000 cfm each at 8 psi for sewage aeration.

May we give you the benefit of our experience in figuring your compressor requirements?

Atlanta • Boston • Charlotte • Chicago • Cleveland • Denver
Detroit • Edmonton • Helena • Houston • Kansas City • Los Angeles
New Orleans • New York • Philadelphia • Pittsburgh • Rochester
St. Paul • Salt Lake City • San Francisco • Seattle • Toronto
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DE LAVAL STEAM TURBINE CO.
TRENTON 2, N. J.

C-3

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS • CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS AND COMPRESSORS • IMO OIL PUMPS

Dependable!
Rugged!

VALVES
HYDRANTS

M & H Flap Valve

VALVES: A.W.W.A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

Hydraulically Operated: For remote control of operation and for quicker, easier opening or closing. Can be supplied in any of the standard sizes of M & H A.W.W.A. gate valves, either high or low pressure.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

M & H Shear Gate

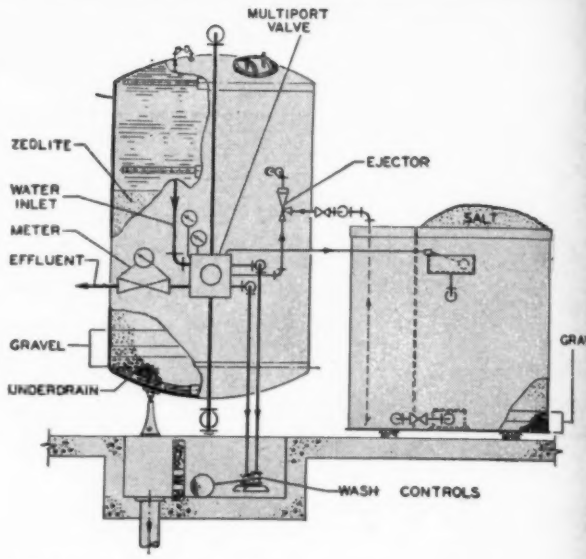
Write for Catalog No. 34

M & H PRODUCTS INCLUDE

FIRE HYDRANTS	SHEAR GATES
GATE VALVES	MUD VALVES
TAPPING VALVES	VALVE BOXES
WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
FLOOR STANDS	B & S FITTINGS
EXTENSION STEMS	CUTTING-IN TEES

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

Why LIQUON
SODIUM ZEOLITE WATER SOFTENER is ideal for many municipalities



A LIQUON Sodium Zeolite Water Softener is frequently the most advantageous method of softening hard water for households and industries, and has the following advantages as compared to other processes such as lime soda:

- Usually occupies much less space, due to its efficient design and the use of LIQUONEX CR, the modern high-capacity non-siliceous resin type of zeolite.
- Easier and simpler to operate, by means of an efficient single multiport valve which controls all operations with one lever.
- The treated water is stable and does not tend to after-react, even when the raw water varies in composition.
- Chemical costs less when non-carbonate hardness is high.
- Handling of chemical is much less troublesome.
- Forms no precipitates or sludge to cause disposal problems.
- Does not add any objectionable excess of reagent to the water.
- Can be operated under pressure and avoids repumping.

LIQUON equipment designs and process recommendations are based on 30 years of experience in specializing on water-conditioning problems. Write for Bulletin 5 describing LIQUON Zeolite Water Softeners, and for advice, without obligation, on any water-treatment problem.

LIQUID CONDITIONING CORPORATION

114 East Price Street, Linden, N. J.
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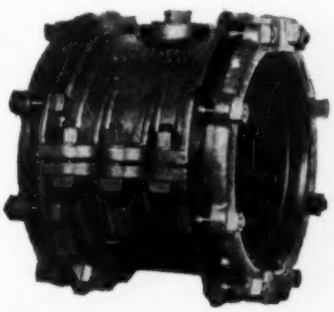

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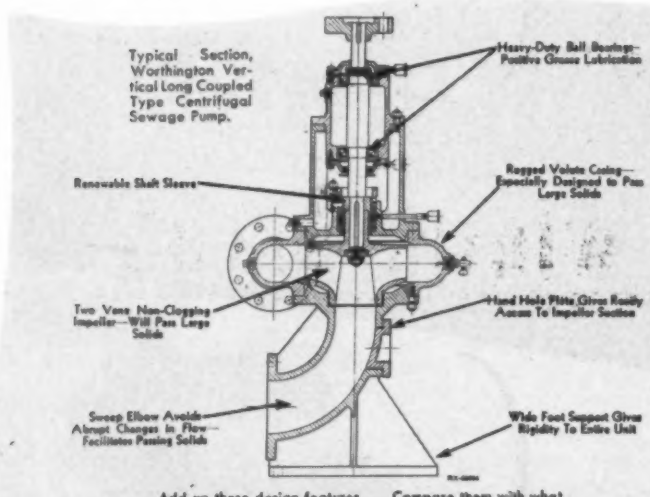
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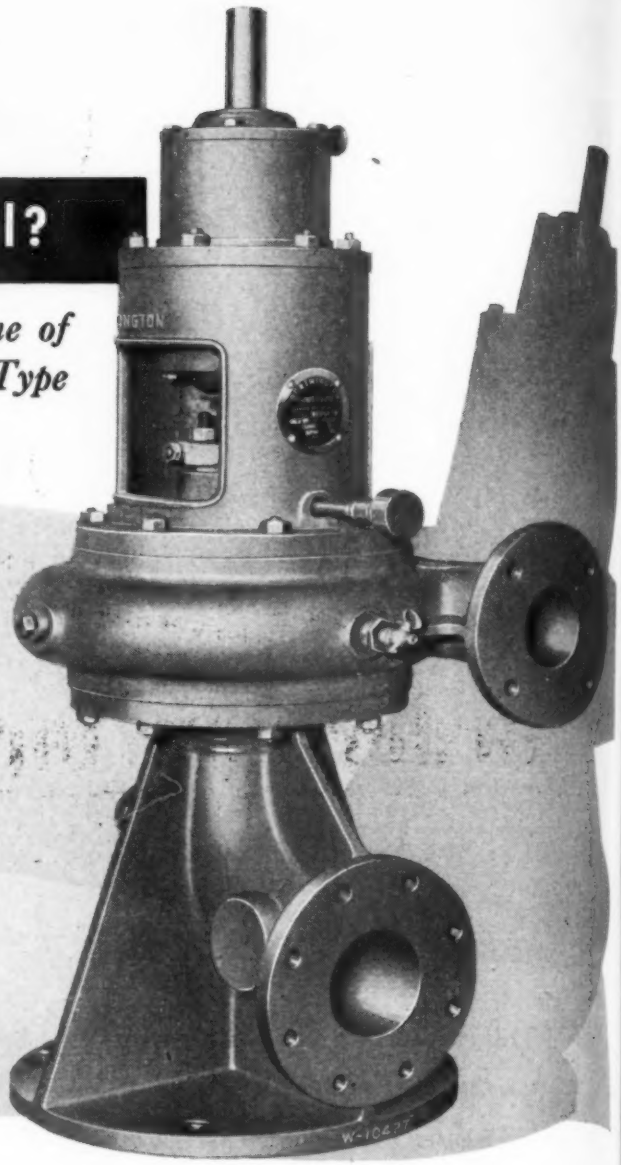

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WORTHINGTON

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All credit for this health and sanitation movement must be given to farsighted sanitary authorities and

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1. "Why should food waste be instantly removed?"

Because, like human waste, food waste is organic matter—odorous and putrefactive, attracting germ-spreading flies and rodents, it is a dangerous source of infection.

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Yes! Disposalls have been installed in more than 300 communities. Their efficiency in actual use, plus extensive laboratory testing for more than ten years, has proved Disposalls to be 100 per-cent efficient in the removal of food waste.

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Although similar to human wastes and other solids now flowing through your lines, Disposall-processed food wastes are smaller, more water-buoyant and uniform in character. These wastes are ground in a controlled amount of cold water, which congeals and "homogenizes" greases into a form which will not clog sewer lines.

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Not for a number of years will the number of Disposalls in the average community become large enough to add appreciably to the loading on the normal treatment plant.

Even if every home in your community used a Disposall, the *volume* of sewage flow would be increased by *less than two per cent.*

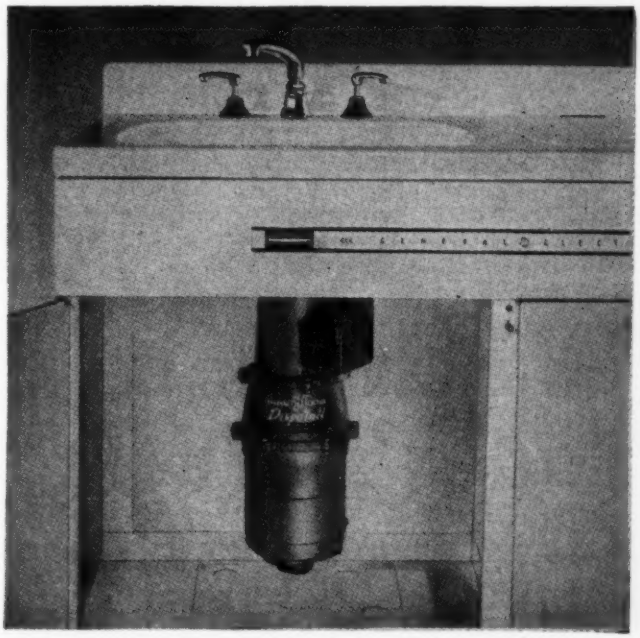
The addition of food wastes to the sewage flow will naturally increase solids and organic loading on the plant. But many plants will be able to handle this gradually increased loading for some time; others can be expanded when necessary.

5. "Are sewage treatment plants necessary?"

Whether or not Disposalls are used, we believe that every community should have a sewage treatment plant. The Disposall method accentuates the need for these plants. They are needed! They provide a vital safeguard for public health!

6. "How can I get more information?"

Further information about Disposalls—and the Disposall method—is yours for the asking. We shall be glad to send complete information, to answer any specific questions you may want to ask. Please write to Department SWE 847, General Electric Company, Bridgeport 2, Connecticut.



The General Electric Disposall shown installed in our Electric Sink. Food waste is scraped into drain opening and safety cover placed in position. Cold water tap is then turned on, starting the Disposall operation. Food waste is shredded and flushed away automatically.

Disposall

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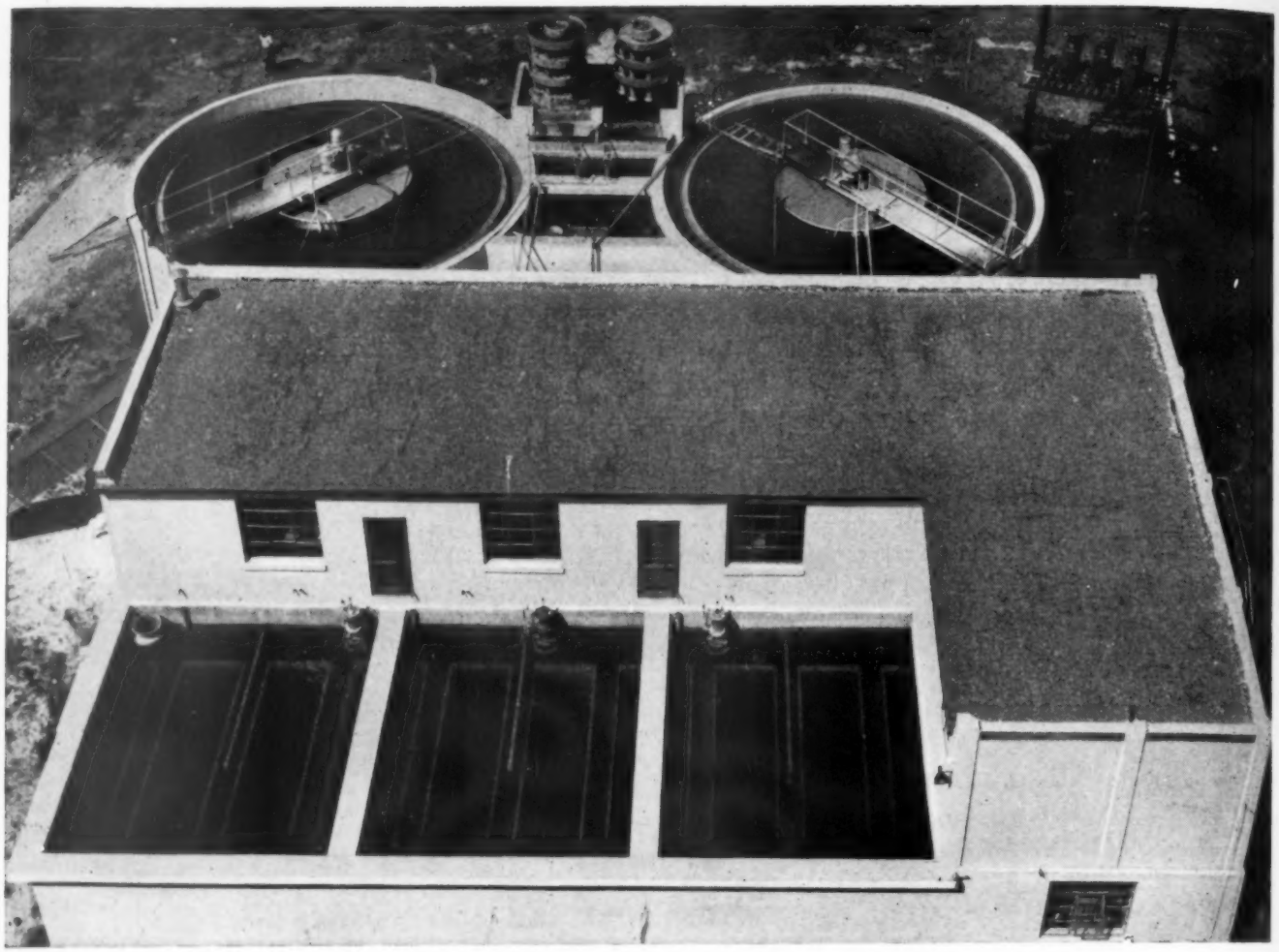

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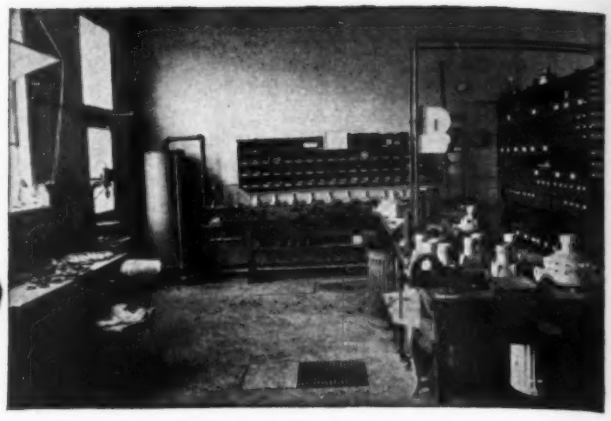

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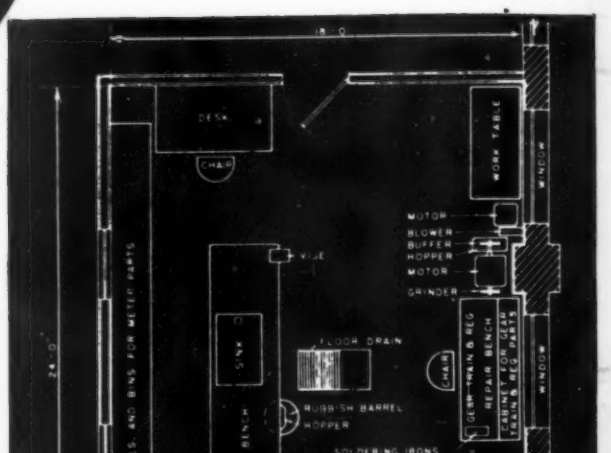

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177

WATER & SEWAGE WORKS

VOL. 94, NO. 10 OCTOBER, 1947

A Gillette Publication

SIGNIFICANCE OF LEGISLATION FORBIDDING STRIKES BY PUBLIC EMPLOYEES

By WENDELL R. LA DUE
Chief Engr. and Supt.
BUREAU OF WATER & SEWERAGE
AKRON, OHIO

ONE of the most quoted statements on collective bargaining between public employers and employees is contained in a letter dated Aug. 16, 1937, and addressed by former President Roosevelt to L. C. Steward, President, National Federation of Federal Employes. It sets forth a particular philosophy held and expressed by many today, ten years after its writing.

Roosevelt Opinion

The statement is quoted here in full, because its implications have often been misconstrued upon partial reference.

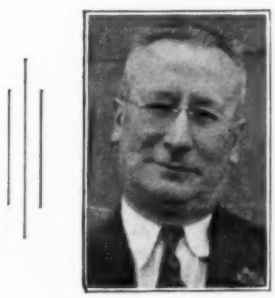
THE WHITE HOUSE,
August 16, 1937

MY DEAR MR. STEWARD:

As I am unable to accept your kind invitation to be present on the occasion of the Twentieth Jubilee Convention of the National Federation of Federal Employes, I am taking this method of sending greetings and a message.

Reading your letter of July 14, 1937, I am especially interested in the timeliness of your remark that the manner in which the activities of your organization have been carried on during the past two decades "has been in complete consonance with the best traditions of public employe relationships." Organizations of Government employes have a logical place in Government affairs.

The desire of Government employes for fair and adequate pay, reasonable hours of work, safe and suitable working conditions, development of opportunities for advancement, facilities for fair and impartial consideration and review of grievances, and other objectives of a proper employe relations policy, is basically no different from that of employes in private industry. Organization on their part to present their views on such matters is both natural and logical, but meticulous attention should be paid to the special relationships and obligations of public servants to the public itself and to the Government.



The Author

All Government employes should realize that the process of collective bargaining, as usually understood, cannot be transplanted into the public service. It has its distinct and insurmountable limitations when applied to public personnel management. The very nature and purposes of Government make it impossible for administrative officials to represent fully or to bind the employer in mutual discussions with Government employe organizations. The employer is the whole people, who speak by means of laws enacted by their representatives in Congress. Accordingly, administrative officials and employes alike are governed and guided, and in many instances restricted, by laws which establish policies, procedures, or rules in personnel matters.

Particularly, I want to emphasize my conviction that militant tactics have no place in the functions of any organization of government employes. Upon employes in the Federal service rests the obligation to serve the whole people, whose interests and welfare require orderliness and continuity in the conduct of Government activities. This obligation is paramount. Since their own services have to do with the functioning of the Government, a strike of public employes manifests nothing less than an intent on their part to prevent or obstruct the operations of Government until their demands are satisfied. Such action, looking toward the paralysis of Government by those who have sworn to support it, is unthinkable and intolerable. It is, therefore, with a feeling of gratification that I have noted in the constitution of the National Federation of Federal Employes the provision that "under no circumstances shall this Federation engage in or support strikes against the United States Government."

I congratulate the National Federation of Federal Employes on the twentieth anniversary of its founding and trust that the convention will, in every way, be successful.

Very sincerely yours,
(Signed) FRANKLIN D. ROOSEVELT

As this statement has been extended to cover *all* public employees, whether engaged in governmental functions or employed in proprietary activities undertaken by governmen-

This paper, presented by President La Due before the Am. Water Works Assn., at its annual meeting in San Francisco in July, was scheduled for publication in our September number. Unfortunately it could not be printed last month and although it has since appeared in the *Journal of the Am. Water Works Assn.*, we consider Mr. La Due's analysis of the situation now confronting water and sewage works employees, and his recommendations of remedial measures for this situation, of such importance that we feel justified in advancing its circulation by devoting space to this already published paper by the retiring president of A.W.W.A.—The Editor.

tal organizations, it may be analyzed to advantage:

1. It recognizes the need and propriety for employee organizations in public work.

2. It recognizes that the public employee's desire for a proper employer-employee relation policy is no different from the desire of employees in private industry.

3. It concedes that the public employee's views may be presented but holds that there are *special* relationships and obligations of public employees to the public itself and to the Government.

4. It warns that the process of collective bargaining as usually understood (with a strike threatened if the terms are not satisfactory to the worker) cannot be transplanted into the public service.

5. It states that the *nature* of Government makes it impossible for public management, of itself, to represent fully or to bind the employer (the public) in management-labor discussions.

6. It contends that because the employees' services are functions of Government, a strike by them is nothing less than an intent to prevent the operation of Government. Such action by those who have sworn to support the Government is, therefore, considered "unthinkable and intolerable."

An editorial in the *New York Herald Tribune*, Sept. 26, 1946, stated:

We have repeatedly urged in these columns that present labor legislation and its judicial construction be amended to differentiate between strikes which only indirectly affect the public and those, such as this one in Pittsburgh, which hit the public where it lives. The right to strike should not transcend the right of millions of human beings to the comforts and necessities of normal existence. Utilities deserve a category of their own when it comes to laws dealing with labor disputes, as recognized in the case of railroads, and among utilities should be classed all vital public services. . . . We are not arguing here for a prohibition of strikes but for *machinery that greatly discourages them* whenever the public is the principal target.

State Anti-Strike Laws

It is known that many states, including New York, Ohio, Texas and Virginia, have passed laws "prohibiting" strikes of public employees and declaring such action to be "against the public policy."

Upon signing the New York state bill which calls for automatic dismissal of striking public workers of the state and its political subdivisions, Governor Dewey is reported to have said that such strikes could (not would) lead to anarchy through a paralysis of government and of all society, and that the state cannot permit such action and survive.

The near-hysteria resulting in legislation outlawing strikes by public employees may be illustrated by the experience in Ohio. Public employee anti-strike bill (Ohio 97th General Assembly S.B. No. 261—Mr. Ferguson) "provides *disciplinary* action in case of strikes by persons employed by the State of Ohio, or any political sub-division thereof, or in any other branch of the public service." Section 2 of this bill states: "No person . . . in the service of any authority, commission or board, or *in any other branch of the public service* . . . shall strike."

It seems that the last phrase, which includes "public service" without defining it, can be subject to very broad interpretation without firm understanding. The stated purpose and object of the bill is to "provide *disciplinary* action in cases of strikes" but the bill itself says: "No person . . . called a public employee, *shall* strike." Is this contradictory thinking or just "legal" verbiage? It is of interest to note the softening effect when various pressure groups start working.

Originally the bill provided that:

1. Any employee striking or seeking to persuade an employee to strike loses his position and all civil service rights.

2. Such employees may be rehired and paid a salary no larger than they received before they left their jobs, and their compensation cannot be increased until after a period of three years.

3. Such employees would be on probation for a period of five years and would serve without tenure at the pleasure of the appointing officer.

When the bill was being considered, the committee, obviously reacting to public sentiment, amended the bill to provide that:

1. Compensation could not be increased until after a period of at least one year, instead of three years.

2. The probationary period would be two years instead of five years.

3. Discharged persons could appeal to the courts.

Civil Service Status

The interpretation of the municipal employee's status made by civil service commissions of most municipalities generally holds that:

1. A civil service employee of the municipality is as safe in his job as is an employee under federal or state civil service.

2. His position is not guaranteed. It may be abolished for lack of funds or lack of further need.

3. Employees are not expected to play politics to hold their jobs, and it is not consistent with civil service status to take an *active* part in political campaigns.

4. Employees may be discharged upon written notice giving reason. Appeal may be made to the civil service commission, whose decisions have been declared by law to be final.

In subscribing to the Association's own Code of Practice, A.W.W.A. members find the specific pledge:

10. I shall not as an incident related to discussion of rates of pay or condition of employment suspend or fail to perform the duties entrusted to me nor permit water service to fail the citizens who depend upon me.

and further, in the general statement:

I shall, having associated myself with public water supply operation, hold the public interest superior to my personal interests and I shall by my acts and by my leadership see to it that water service is maintained under both normal and emergency conditions.

Negative Approach Usual

It seems significant that all of the statements, laws, explanations, and codes appear to be negative, prohibitory and almost punitive in their attitude toward the public employee.

Any such negative or "anti" attitude expressed in law is by experience recognized to be dependent upon the desire or acquiescence of "the people" for its enforcement. If it is not wanted by large numbers of people, it will not and cannot be enforced. We have only to recall past liquor prohibition legislation, NRA and OPA at the local level, where bootlegging, violations and black markets thrived in the face of half-hearted enforcement. As President Truman recently said, "Cooperation cannot be achieved by force of law."

A recent news account directed the people's attention to the fact that the Fourth of July was not a *legal* holiday, there being in Ohio only four legal holidays for "all purposes": The Sabbath, Saturday afternoon, Labor Day and Armistice Day. All others, such as Christmas, Thanksgiving, and so on, are holidays only

for "negotiable instruments," whatever they may be. This is cited to show that *custom* and *common desire* sometimes transcend the written law. Any law which thousands of citizens do not want will become either inoperative or unenforceable. Literally hundreds of so-called "social" laws are in this category.

The idea that the law must fit the time is reflected in the divided attitude of the United States Supreme Court. Should this final judicial body follow the will of the people at the moment or should it "protect" them from wide swings in day-to-day thought? Columnist Ruth Gmeiner reports that Supreme Court Justice Wiley B. Rutledge once said: "Courts and judges owe something more than the negative duty to sit silent and blind while men go on their way to prison for want of any hint of their rights." Is a law that thousands dislike to be regarded as a "good" law, to be upheld regardless?

Comparison with Private Employment

To return to the problem affecting public employees, specifically in the utility field, there may be noted a seemingly growing unrest among public employees coupled with the inability of public management to induce the desirable type of younger men to enter the utility field. Water works executives must ask themselves these questions: Is there something specifically lacking in their house? What do men employed in water works organizations want? Wherein is the public utility employee the same as or different from the employee in private industry?

One may answer: It is evident that the public employee is a person having wants, desires and reactions comparable to those of the private employee. Both will compare and draw conclusions, during discussions with each other, about their relative ability to satisfy their desires and wishes in their particular place of employment.

The public employee has the same financial and cultural desires for himself and his family. Self-interest is one of the strongest urges found in human nature. No one can have a greater interest in others than in oneself. We never worry too much about the abstract person. Natural wisdom obviously says to us: get all you can from others (first), and then add to it, by helping yourself.

In a democratic society, all men live under, and are supposedly subject to, the same laws, regardless of employment. If this be so, then the public employee would have the same status before the courts as those in private industry. Man for man and group for group, public employees are the equal, both physically and mentally, of like groups in private industry. Why, then, are they separated and subjected to special, oftimes punitive, legislation?

In those phases of public employment involving craftsmanship, the public and private employee often belong to the same labor organization; their skill and responsibility for support of their craft are equal. Consequently, we must ask, ought there to be a difference in their treatment by the public? Wherein might public employees be considered different from employees in private industry?

It is generally thought that public employees *always* are protected by adequate tenure of office provisions, with pensions or, in lieu thereof, an assured job on the payroll, all under the general heading of civil service. Those who are familiar with the behind-the-scenes activities of public employment know how misleading this general belief can be.

In discussions regarding rates of pay to conform to private industry, management in the public employ often resorts to the argument that they are tied financially. Typical statements are reported:

1. The budget for the year has been prepared, tax rate set and, therefore, rates of pay cannot be increased.

2. The price of service—taxes—cannot be increased due to limiting figures set by law outside the control of the local administration.

3. Top management salaries are fixed by law and it is intolerable for subordinates to exceed or even approach too closely these rates.

Frequently, however, when pressure was being exerted by organized labor and strikes were imminent, the published reports were that funds had been "found" and adjustments made. This attitude on the part of some in public management, if pursued unwisely, is very apt to make the public employee skeptical of statements of financial "hand-tying." He becomes cynical when confronted with what he calls the propaganda that he is working for the public interest and the welfare of the people and should take pride in his work. The story is told of a public employee organization to which the management presented this view; whereupon some, not affected, sardonically remarked that "they received pay and did not have to take pride in their work."

The proposition that public employees work for the public interest implies that those in private industry do not. We all know, especially in the utility field, that employees of private enterprise do work for the public interest and are as conscious of their obligations to the citizens as are those in publicly controlled and operated utilities, often more so.

Causes of Unrest

Bearing these thoughts in mind and returning to the knowledge that public employee legislation is "against" and punitive; that public employees are physically, mentally and morally like other employees; that the advantages of civil service, either to the employee or to the employers—the citizens—are, in the aggregate, not too great; what then is the significance of anti-strike legislation directed toward public employees?

Briefly, it is believed to be: first, a result of the prevailing anti-strike attitude; and, second, an expression of the American attitude of "there ought to be a law," regardless of whether it is equitable, workable or even desirable.

What then can be done to offset the demand for such legislation? The A.W.W.A., representative of both management and labor, is concerned with large numbers of public employees throughout the nation. It should be a leader in the endeavor to arrive at a safe and sure management-labor relationship in the public employee field. The Association's Public Relations Study No. 3 contains much that could be absorbed by management interested in improving employee relations, as well as general public relations.

We must endeavor to discover the cause of the growing unrest among water works employees and the apparent inability of water works management to induce desirable young men to enter public employment. We know the field is vital and interesting and should offer the employee a position of steady employment with reasonable assurance of promotion both in the responsibility and financial return.

What does the public employee seem to want that is so often lacking?

1. He wants to be considered a human being, a continuing asset to be incorporated into the being of the utility, and not a commodity to be used up and discarded. "Willing

Water" wants to be *of* the water works, not *with* it.

2. He wants cooperation between management and labor. The "we" and not the separative "you and me" attitude.

3. He wants, although he may not know it, patience, understanding and consideration. In its dealing with labor, management should have a sense of humor—real, not the joking kind. Management is older, wiser and more experienced. Temporarily, the employee may seem impatient. Often management, in turn, will react against this with impatience, but it must be remembered that the freedom of labor is relatively young, and, like any young being, is led by visions of immediate advantages. He does not, as yet, know how to exercise his new-found power. He has a philosophy of freedom from fear and from being "pushed around." History relates that our own Revolution gave birth to the ability of our citizens to tell traditional authority where to "head in." It took many years, however, to subordinate the new-found liberty to allow democratic government to proceed in an orderly manner. Under such stringencies, laws should direct the youthful idea but not force it. Again, cooperation has rarely been achieved by mere force of law.

Some organizations are urging that the position of cities be strengthened by laws that bar strikes by municipal workers and bar city employment to strikers and leaders judged guilty of endangering public health, safety and welfare. Such demands might well be viewed with a certain degree of alarm by those in management interested and responsible in a function that is so vital to the public health, safety and welfare.

The Ohio Common Pleas Court of Mercer County (Docket No. 14383, decided Nov. 27, 1941) refused to issue an injunction restraining striking employees from picketing a municipally owned light plant. The Court based its decision on the fact that the village was "engaged in a proprietary function and as such has the powers of and is liable to the same law as an individual or private corporation."

The recent Taft-Hartley Act has served notice to the top labor leadership, as well as to management, that they and those for whom they pretend to speak are no longer beyond a law urged and desired by their many friends. By many it is believed that when labor grows up and assumes its rightful place beside management in American economy, both will look back on the Taft-Hartley Act as the starting point in orderly and badly needed reform on their outlook on the economic life of the country.

If the "we" attitude is to be established, public management must do its share in the undertaking. Management must restore in the worker the inspiration to work. If management of public utilities cannot find a way to do justice to public employees and to the public at the same time, it must confess to failure to sustain the social structure that has been set up. Wise management will realize that it will obtain its objective of continuous service more quickly and more surely by using tact and a basic knowledge of human behavior rather than by resorting to the techniques of "legal" interpretation. The "man-to-man" approach has been proposed as being preferable to all coercive laws.

The Employee's Viewpoint

In a series of articles in *Harper's Magazine*,[1] and, in a more popular vein, in *Collier's*,[2] Peter F. Drucker sets forth very clearly the employee's viewpoint. The reasons why men strike, as given in these articles, include their conviction that labor strife—which is not considered to be between capital and labor but rather between management and labor—is inevitable. The causes of unrest are almost always to be found in concrete policies and objective conditions. Wage disputes are but an expression of bitterness and mutual distrust in the plant. Managerial unfairness; the effects of certain types of assembly-line work; the tendency to organize work and pay schedules in such a way as to isolate the workers, or set one against the other, and thus prevent teamwork; and the economic insecurity of the worker—these four factors are given as the causes of industrial conflict.

If a genuine partnership between management and labor is to be obtained, according to Drucker, a new approach must be worked out. Such an approach would run counter to present prejudices of management and the worker by asserting that both are human beings. Management's feeling that the worker is only interested in his pay is countered by the worker's impression that management exploits him economically to make a greater profit; the elimination of this distrust is the first prerequisite to industrial harmony. The second step is for the worker to find in his work a satisfaction beyond the mere financial reward. And, finally, the plant must offer him satisfaction in the form of recognition and prestige.

Common errors of management in attempting to obtain closer partnership with employees are to rush into print with handouts or to attempt to establish communication with the worker by the human touch of the "open door." The fact is that management does not know how the worker sees things; management does not listen to him or know how to listen; and therefore its first problem is to learn how.

Attempts to bring the worker into partnership with management through financial incentive usually fail because the payments are small, they are made in times of high earnings, when they are least needed, and the workers are not really given an understanding of the importance of increased production and profits.

The worker wants satisfaction in his work. To give him this satisfaction, management must not tell him what, in *management's* opinion, he ought to feel or want to know. The early efforts must be concentrated primarily upon non-contentious technical matters. Gradually the worker may be brought into the planning and layout of the work, and thus be shown how his own job fits into the whole product or process.

Management's Part

To overcome the obstacles to a labor-management partnership, therefore, it has been suggested, on the one hand, that management rid itself of the idea that its responsibility ends with the pay check, and see the worker as a human being and the plant as a social institution in which he is a citizen. Management must look for the underlying principles rather than for trick panaceas, and the idea that a sound labor relations policy is a means to "bust" the union must be abandoned.

On their side, labor leaders must abandon the idea that their function is to protect labor against management and against society. But it should be remembered that unions have offered the worker the hope of personal and social satisfaction which management should have given him.

If both management and labor are unwilling or unable to achieve industrial peace, the common impulse is to turn to government for a solution. It should be noted that the standard definition of a public utility as "a legal monopoly affected with the public interest" is an almost perfect description of the modern large-scale

union. In such matters as jurisdictional strikes, union restrictions on output and strikes against the public welfare, there must be some definite government regulation of employee and union rights and responsibilities. If there are maintenance of membership clauses in labor contracts, a man can be cut off from his source of livelihood in the same manner as a professional man whose license has been revoked. The unions thus exercise governmental functions, and many believe that they should, therefore, be at least subject to "due process of law."

Although government action may be desirable in effecting purely financial settlements, no single over-all formula should be made for a country as large and varied as the United States. It is also urged that the government revise existing practices and policies which tend to reward labor conflict rather than labor peace.

Many such discussions and articles seem to put the blame for labor unrest upon management. To paraphrase a recent statement, however, management is worthy of being a leader when it never complains of the stupidity of the worker or the lack of appreciation of the public. Hearing these complaints is a part of management's job, and to meet them and not go down to defeat is the final proof of good management.

Labor Unions and Municipal Employee Law

Last year the National Institute of Municipal Law Officers published a book entitled *"Labor Unions and Municipal Employee Law"* by its general counsel, Charles S. Rhyne of Washington, D. C.[3] The book, based upon a survey of 400 of the largest municipalities in the nation, reviews municipal, state and federal experience in dealing with labor unions of public employees. It covers legality of union membership by municipal and other public employees, instances in which cities can prohibit union membership (as of police) and then considers questions which are raised by union demands for labor contracts with cities. Examples of the questions upon which all available experience and authority is presented in the volume are: (1) exclusive bargaining rights for unions; (2) the closed shop; (3) unlawful preferences to unions; (4) the check-off and voluntary assignment of municipal wages to unions; (5) arbitration of disputes; (6) the right to strike; (7) the right to picket municipal property; (8) violation of civil service laws by union contract provisions; (9) delegation of public power to private labor union organizations; and (10) many other questions involving particular proposed labor union contract provisions and the authority of cities to enter into such contracts.

The chief conclusions of the book may be summarized briefly:

1. Municipal employees may organize or join unions except if the nature of their employment (police) makes union membership incompatible with their public duties.
2. Signing of contracts delegating municipal powers to labor unions, or the granting of undue preferences to unions, is considered illegal.
3. Collective bargaining, in its private industry sense, cannot be transplanted into the public service.
4. Agreements resulting in conflict with civil service or other laws are illegal.
5. The closed shop in public employment is illegal.
6. The check-off device is generally regarded as an unlawful preference in favor of the union and therefore is illegal.
7. Arbitration agreements constitute an improper delegation of municipal legal authority.
8. No right to strike exists for governmental employees.
9. Picketing which prevents or interferes with the carrying out of a city's functions is illegal.
10. The exercise of a "governmental" or a "proprietary" function in the utility field does not affect the right or the disability to enter into a labor union contract with a union of municipal employees.

A survey of city employee-union relations was presented in *Business Week* for Feb. 22, 1947.[4] The survey pointed to the increased attention to public employee organization that had been attracted by recent strikes and threats of strikes by teachers, transportation workers and other government employees. Demands for special legislation to restrict the union rights of public employees were being heard in state legislatures. Most of these bills would: forbid any government subdivision from granting exclusive bargaining rights to any one union; outlaw strikes by public employees; and, although permitting them to join unions, prohibit the signing of contracts which would force them to join against their will. It was held that the refusal of cities to deal with unions on wage increases was not the result of an anti-labor attitude but rather the necessity of conforming to annual budgets.

It was shown that at least 68 municipalities had recognized unions for the first time in 1946; that all of the 14 cities in the nation with more than 500,000 population had contracts with one or more unions, and that approximately 60 per cent (or 618) of the cities with populations exceeding 10,000 bargain with some union, and that union pressures for recognition were continuing.

Remedial Measures

Confronted by anti-strike legislation, the public worker is said to look forward only to government regimentation, or draft or paternalism by private organizations, and neither of these alternatives was considered to conform to the American way of life. This point is emphasized by the law recently passed by the Congress setting up machinery for loyalty checks on all federal workers and job applicants.

It is believed that the American Water Works Association should be one of the leaders among utility management organizations to promote a forthright policy of management-worker relationship which will make anti-strike legislation inoperative by making it unnecessary.

What *must* be the cardinal points of such a policy?

First, public management must be given freedom of action in its relationship with its public utility workers. That is, it must be able to stand aloof from petty political considerations in local government.

Second, public management must show firmness and fairness in its dealing with the workers. It must not fall back on anti-strike legislation and become either a regimented taskmaster or a hypocritical paternal overseer. Likewise, if public management has the support of anti-strike legislation, the workers should have the protection of an independent body to consider and establish equitable wage rates. Such a body should also be enabled to set corresponding utility rates, so as not to hamper management in its duty to the public and the public employee.

Third, both public management and public workers must realize and carry out their responsibility to the public.

What has been said of allied activities in postwar Europe is also true of the dealings of management with workers—they are all negative. Measures, such as anti-strike legislation, are "against," not "for"; disciplinary, not cooperative. Manage-

ment has been accused of always fighting "against" the worker and consequently it has presented Unionism, its so-called opponent, with the most precious asset in any kind of combat—the initiative.

It is suggested that the public worker be encouraged to feel that he is a human being and the master of his own fate, not helpless flotsam on the current of management control.

This digression from the subject of anti-strike legislation stems from the desire to set forth a policy, which, if *earnestly* undertaken by public management, will tend to make anti-strike legislation inoperative. The operation of much current anti-strike legislation cannot be considered good public relations. Knowledge begets understanding, and from understanding comes agreement.

If public management is extended the privileges of definite anti-strike legislation, it cannot escape the implied obligation of providing the public employee with those things which the "outside world" of the private employer has provided to the private employee.

Management is becoming more and more aware that knowledge in the field of human relations is just as vital as technological "know-how." Familiarity with the many phases of the social sciences, such as economics, psychology and sociology, is most important to men and women who deal with each other as human beings. The chief job of public management and the public employee is to "humanize" their relations in the eyes of the public they serve. This is especially to be desired since the important objective is the reaction of the public as a whole—the public attitude.

It is apparent that the American Water Works Association, through its officers and through its members, should encourage *both labor and management* to strive earnestly and continuously to obtain what is intuitively known to be the better management-worker relationship. And, in so doing, let us not fall back on that Americanism: *There ought to be a law!*

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ADJUSTING RATE STRUCTURES TO RISING COST LEVELS

(A Correction)

In the September issue of *Water & Sewage Works* there appeared an article by Louis R. Howson, Cons. Engr. of Chicago. The article was titled "Adjusting Rate Structures to Rising Cost Levels." In this article, the figure for the tonnage of water produced annually was in error and that error affected Figs. 1 and 3 and paragraphs 3 and 5 on pg. 305. Mr. Howson has supplied the corrected paragraphs, which should read as follows:

Par. 3—"As a commodity, water is most important. Fig. 1 indicates its importance as measured in the annual tonnage produced, compared with coal, steel, wheat and cement. The tonnage of water delivered to American distribution systems in a year is 17 times the tonnage of all the coal mined in the United States. It is approximately 140 times the tonnage produced by all the steel mills in the country in their banner year. It is 400 times the tonnage of wheat grown in a billion-bushel crop year."

Par. 5—"As a transportation system the water works of the United States transport over 12,000,000,000 tons of water per year, or 400 per cent as much tonnage as all of the roads of the United States. The average revenue from this transportation service by the water works (Fig. 3) is approximately 0.05c per ton-mile, in contrast to the 0.95c charge per ton-mile of American railroad freight transportation. The water works revenue also includes the cost of the commodity transported, whereas the railroad revenue does not."

In making these corrections, Mr. Howson points out that these corrected figures emphasize more than did the incorrect figures, the relative size and importance of water supply to other industries.

DORR CO. CELEBRATES 30TH ANNIVERSARY OF WESTPORT MILL

The thirtieth anniversary of Dorr Company's acquisition of the Westport Mill, its research and testing plant at Westport, Conn., was celebrated on Saturday, September 6, at a picnic birthday-party at the plant, attended by some 250 members of the staff, their families and professional friends of the company. Mr. John V. N. Dorr, owner and founder of the company, acted as host and presided at the cutting of the two huge birthday cakes.

The original Westport Mill was a frame and shingle grist mill, built shortly after the Revolution. It was purchased by Mr. Dorr in 1917. In 1937, after a fire, it was completely rebuilt as a modern laboratory. In 1944, a semi-works plant was added, where research and process development are conducted for the company's own account and for its clients.

Scenes During the Westport Mill Contests and Picnic.
Amongst the most exciting, the canoe-tilting contest and the ball games. "J. V. N." himself at one of the tables, and to his right Mrs. "Tony" Fischer.

AWWA PAPERS AND DISCUSSION

Presented at the 1947 Convention in San Francisco

THE first installment of this report covering the 1947 Convention of the American Water Works Assn. appeared in our September issue. The second installment follows herewith.

G. E. Arnold
Asst. City Mgr.
San Diego, Calif.

A. P. Kuranz
Mgr. Water Utility
Waukesha, Wis.

Applying Business Principles to Water Works Operation

The second general session was devoted to a group of papers dealing with water works management and the results from applying business principals thereto.

"Applying Business Principles to Water Works Operation" by Gerald E. Arnold, Ass't. City Manager, San Diego, Calif.

Mr. Arnold, in his exceptionally well presented talk, introduced his topic by saying that water rates should be such as to leave a surplus in profit for the Water Department but not enough to tempt the town fathers to capture the accummulated surplus. He revealed the fact that San Diego has a new charter which will make the Water Department a separate entity and not subject to capture of funds or political expediency. The importance of water in California was emphasized and San Diego is even now planning 20 years ahead in water supply, looking to the ultimate use of Colorado River water which will involve expensive treatment and transportation.

Getting into details, Mr. Arnold compared the appearance of Water Department offices with those of such private utilities as the Telephone Co. or the Electric Utility and urged that water works management take more pride in their quarters and by improving their appearance secure the approbation of the public. Why not, he asked, dress the place up a bit with growing plants, cut flowers, pictures? Why not use the front windows as display windows. Laboratory equipment always draws interest of the public and a display of water meters and other equipment is definitely worthy of consideration.

In billing and collection the bimonthly reading of meters and billing is proving by far preferable and less expensive. However this program necessitates prompt meter reading on definite schedule or the lag will prove costly.

Concerning water works personnel and public relations, Mr. Arnold advocated the encouragement of employees to become more familiar with the complete water supply system and talk about it to friends and neighbors. Employees should know each other better and learn what the other fellow's duties are. Plant operators making contact with the public should be uniformed—but neat above all. Filter plant operators and laboratory personnel should be attired in confidence-inspiring white uniforms. In short, if municipally owned Water Departments are to secure their proper status in public relations the management of these departments must take a page from the book of experience of the privately operated utilities, banks and other service corporations which cannot depend upon the monopoly aspect of their business to prevent failure and bankruptcy.

"The Value of Public Service Commission Control to Municipal Water Works Management" by Arthur P. Kuranz, Manager, Water Utility, Waukesha, Wis.

Like the famed bottled water from his home town, Arthur Kuranz came before the A.W.W.A. literally bubbling over with arguments in favor of Public Service Commission control over municipally operated water works. Chiefly the scheme was a method of forcing business-like operation and management of publicly owned utilities on municipal governments. It also effected better working conditions and remuneration for employees and managements.

Mr. Kuranz explained the Wisconsin Public Service Commission's workings and its special set of Regulations Applying to Municipal Water Utilities. The Waukesha Water Utility (not a Department please note) is operated under an appointed commission of 3 to 7 men chosen by the City Council to serve terms of as many years as there are commissioners. The local Commission employs a manager who in turn is held responsible for operation, hiring and firing all employees. The State Regulations specify that Water Utility income is first to be used for paying for efficient operation, maintenance, and to cover depreciation by maintaining an adequate sinking fund. Surplus after this may be used for retirement of bonds or *may* be turned over to the municipality's general fund if the Commissioners elect to so do.

The highly desired features of the scheme are the following. No elected city official can serve on the Water Commission and the Mayor has no appointive power. A uniform system of accounting is mandatory in Wisconsin—for privately or publicly owned utilities. A tax equivalent *must* be paid into the City Treasury by the Water Utility but the Utility is credited with the value of water supplied public buildings etc. and with fire protection costs. All of this makes for the maintenance of effective and equitable water rates.

The Supreme Court of Wisconsin has held that water supply is first a business operation and secondarily a public service operation and that the local Commission is solely responsible for the Water Utility. Further than this, although not mentioned by Mr. Kuranz, it has been held legal for the Water Utility to finance the installation of sewage treatment in any case wherein such treatment provides a factor of safety in connection with

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the local water supply—to wit, the case of Waukegan's "Water Supply Protection Works," commonly known as the Waukegan Sewage Treatment Works, which was financed from Water Utility Surplus a few years back.

Mr. Kuranz pointed out instances in which the Wis. Public Service Commission had forced the City to return funds to the Water Utility when shown that such funds were needed by the Utility. In Waukesha there were charges made that water rates were too high. After its study the State Commission found the Water Utility not charging the City enough. A readjustment was ordered in which the City was required to pay 77 per cent more for fire service and consumers' rates were reduced 33 per cent thereby.

In the discussion ensuing it developed that no local municipal utility wished to be relieved of State Public Service Commission regulation, the gains being far greater than the added requirements involved.

Called upon for an expression, since in Maine the Public Utilities Commission has jurisdiction over *all* Water Utilities, **Fred J. Reny,** General Manager of the Portland Water District said that they had operated under regulations of the Maine P.U.C. since 1915. Under no conditions would the Portland Water District choose any other method of operation—nor would the Water District management ever consent to turn surplus funds over to any of its political subdivisions.

L. R. Hanson, N. T. Veatch and others added the observation that Commission Control had proved sound and therefore popular with competent water utility managers wherever it is in effect. Other States would do well to follow the lead of Maine and Wisconsin which insist on sound financing and management of publicly owned utilities just as much as in the case of privately owned properties—and, WHY NOT?

"The Washington Suburban Sanitary District After 28 Years of Financing and Operating Experience," —by Harry R. Hall, Chief Engineer and Harry B. Shaw, Deputy Chief Engr., Washington Suburban Sanitary District, Hyattsville, Md.

For something like ten years the Program Committee of A.W.W.A. has endeavored to get the story of the successful Washington Suburban Sanitary District told—in particular the joint operation of water and sewage systems and their financing. This was the year, and the story as told by Messrs. Hall and Shaw should prove of value to many in this time of trends toward the establishment of water and sewerage districts, authorities on whatever the designation may be. Naturally we cannot even attempt to do justice to the remarkable amount of information which is available in this paper, which possesses as much value for the "DON'TS" which it contains as for the guidance which it gives in things which should be done. It must be remembered that the Washington Suburban District was a pioneering venture of its kind started 28 years ago and therefore has succeeded the hard way to provide experience lessons for others. The story is factual and all of the "lessons learned,"

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F. J. Reny
Gen. Mgr.
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are brought out to be seen by those who can thereby escape similar hazards in planning Utility and Service Districts of the future. You may read the full story in the *A.W.W.A. Journal*—September or October.

The District's Charter permits the issuance of bonds up to 14 per cent of the assessed property value within the District without referendum. The chief lesson learned in financing was that of under-estimating costs of construction and operation of modern sewage treatment works, and the fact that it is a far safer practice to develop the original tax assessment rate and service rates at a figure higher than actually needed, with the possibility of rate reductions subsequently, than to find the reverse to be necessary—the latter entailing new legislation in order to make the upward revisions. Forty year serial bonds appear to be the most appropriate for the District's needs and provide the most equitable distribution of costs over the 40 year period to properties benefited. The advantages of joint operation and management of the water and sewerage systems has been adequately demonstrated. Likewise the flexibility of financing such joint operations has been demonstrated to be a decided advantage at various times.

"Water Works Rules & Regulations—What Should They Contain?" by M. P. Hatcher, Director, Water Department, Kansas City, Mo.

Mr. Hatcher expressed the opinion that a sound set of Rules & Regulations for any water utility constituted the very first step in good public relations—also that holding strictly to such regulations was of paramount importance to sound management and operations. The scope and purpose of Rules and Regulations is to supplement the actual contract for water service. The standardization of Rules and Regulations is not practicable beyond the fact that a "standard" way be used as a guide or pattern in the preparation of Rules and Regulations for a particular water system.

The above opinion is based on returns from a survey questionnaire to a number of water utility heads, as also is much of what follows. Through use of lantern slide drawings Mr. Hatcher advocated as items which might well be standard in all regulations the following:

(1) That no service line shall cross another's property to reach the customer's property.

(2) Prohibition of split services from a single meter (two or more customers on the same meter).

(3) Prohibition of multiple metering and preference for battery meter installations.

(4) Requirement that commercial and fire services be kept separate.

Mr. Hatcher illustrated several methods by which the last requirement can be solved through the securement of an easement area over the fire line to the service tap.

Upgrading the Water Works Industry

W. T. Ingram, Engineering Field Associate of the Am. Public Health Assn., gave an account of "The Program of the A.P.H.A. for Engineering Personnel" in which an effort is to be made to place better trained men in the water and sewage works field and to lift the entire plane of the industry through education of the Town Fathers to the advantage of placing only trained engineers in charge of the water utility and sewerage systems. At the same time the program will include

efforts to encourage more research and better teaching conditions in the colleges and universities.

"Upgrading the Water Works Industry," by John H. Murdoch, Jr., Chief Counsel, Am. Water Works & Electric Co., New York.

Mr. Murdoch began by stating that with wage rates at $1.25 per hr. for ditch digging and pipe laying labor, water utilities are going to be forced into the greater use of machines in main extensions and the maximum use of compressed air for a variety of operations now performed by hand labor. Plant operations in general must now become more generally mechanized with the employment of remote and centralized control to a greater extent.

Foremen and supervisors must be upgraded also. This classification must know more about plumbing practices and materials, and also be trained in human relations.

As to chemists and engineers, Mr. Murdoch saw a decided need for better chemists who will know the simplest and most economical methods to "keep good water good" in the distribution system. That means a better understanding of corrosion control and prevention of biological degradation of water in the outlying portions of the pipe system. In this direction more A.W.W.A. awards for developmental work, looking toward improved treatment practices, should be established.

As to "management," Mr. Murdoch sees a need for better top management. Managers must know their system and their community thoroughly; must know how to choose and use chemists and engineers and must understand water treatment and purification; must be able to inspire those under them; must know the business side of water works administration and know how to understand and interpret financial reports; above all must know how to obtain team work in his organization.

Steps to be taken involve the better training of foremen and supervisors who in turn can train other employees; the establishment of more Short Courses for water works operators; the encouragement by universities and colleges of men of high type to enter the water supply field. In all of this A.W.W.A. should take the initiative along with its efforts to advance public relations in the water supply field.

"Engineers' Organizations for Bargaining Purposes," by S. S. Green, Engineer, Dept. of Water & Power, Los Angeles.

Mr. Green reviewed the history of the labor unionism movement from the early secret unions (Knights of Labor) to the present when many are forced to join unions by the old Wagner Labor Relations Act and rulings of the National Labor Relations Board. In this latter group engineers and chemists have frequently found themselves. In consequence the Am. Soc. of Civil Engrs. in 1937 decided to do something in the interest of the engineer. At present approximately 10,000 engineers are unionized, notably in the T.V.A. and Central Ohio. Engineers of the Dept. of Water & Power of Los Angeles are organized but no contract can be entered into between a municipally owned utility and any

J. H. Murdoch, Jr. Chf. Counsel, Am. W. W. & Elec. Co. New York

W. W. DeBerard City Engineer Dept. Pub. Works Chicago

organized group. Thirty-seven of the sixty-six sections of A.S.C.E. now have provisions for establishing collective bargaining groups when needed. The Taft-Hartley Act has largely corrected the situation wherein engineers employed in industry have been forced to affiliate with some union, like it or not. This act provides full rights to the professional man to deal independently with his employer's on compensation matters.

"The Significance of Anti-Strike Legislation Directed Toward Public Employers," by Wendell R. La Due, Chief Engr. & Supt., Dept. of Water and Sewerage, Akron, Ohio.

Mr. La Due's paper appears in full as the lead article in this issue because of its character and import to water and sewage works employees throughout the nation. Our only comment in this column is that Mr. La Due is outspoken in his denouncement of any form of legislation which deprives the public employee of such rights and privileges as are also accorded by law to the private employee. It is his well taken contention that Public Utilities are deserving of a category of their own in respect to collective bargaining inasmuch as the strike privilege has been denied those who are employed by utilties.

Mr. La Due made a plea to management of publicly owned utilities that they make it a special problem to get fair and equitable treatment for their employees, in view of the class legislation which will encourage governmental authority to do less for public employees, as they will lack the strike weapon to better their positions from a remuneration angle in these times of a vanishing dollar value. If, he said, public management cannot find a means of aiding public employees then public management is lacking.

"Testing Materials for Water Works Construction and Operation," by W. W. DeBerard, City Engineer and H. P. Hagedorn, Physical Chemist, Dept. of Public Works, Chicago.

Mr. Hagedorn presented this paper which outlined test and inspection procedures employed by Chicago's Dept. of Public Works for materials and equipment. Only registered engineers are employed as inspectors and the cost of this service is but 2% of the expenditure for materials and supplies. Recently 14% of the lumber purchased had been rejected upon inspection alone. Mr. Hagedorn's paper presents in some detail the methods of sampling coal, paint, filtering materials, cast-iron pipe in which standard specifications of A.W.W.A., A.S.T.M., and the Am. Soc. of Automotive Engrs. are relied upon to a major extent. His specification concerning an acceptable inspecting engineer were in themselves interesting inasmuch as these men must be extremely versatile, ingenious and be capable of using a high degree of judgment.

"Results of Fifteen Years of Underground Street Leakage Work in Chicago" by J. B. Eddy, Engr. of Water Pipe Extension, Chicago.

Mr. Eddy's paper, presented by J. L. Irwin, Engr. of Distribution, revealed that in 1911 estimated water losses through leakage in Chicago were 50% of the pumpage. Leakage surveys were abandoned in 1928 but reinstated in 1932. Since 1934 280 mgd. of leakage has been located and stopped. Now Chicago pumps 200 mgd. less water than was pumped 15 years ago, while the water registered through meters has increased 95 mgd. Concurrently water pressure on the mains is now 38 lbs. whereas in 1932, only 22 lbs. pressure could be maintained due to leakage. Plumbing leakage surveys have been con-

tinued throughout the period also, and only recently 3 mgd. of leakage has been corrected.

In reply to questions Mr. Irwin revealed that the Chicago water rates on large consumption had not been changed in 40 years. The equipment employed in leak location included the Aquaphone, service flow tests for major leaks, etc.

"Notes on Long Line Hydraulic Studies" by Fred C. Scobey, Sr. Engineer, U. S. Dept. of Agriculture, Berkeley, Calif.

Mr. Scobey explained methods of taking velocity and flow measurements in large diameter pipe lines for the purpose of establishing the "C" value of new pipe lines and thereafter keeping a record of changes in this all important value with increasing age of the line. For checking new velocity Fluoricine-dye injected with a pressure gun had proved more practical than permanganate. Interestingly in long concrete lines the initial C value of 140 increases to 160 with the socalled slickening of the interior of the pipes. On the whole the end of the line nearest the reservoir shows a greater loss in C value than is recorded farther along. On this score Mr. Scobey advocates increasing the diameter of long lines by about 2 in. from the reservoir dam for a piece in order to compensate for the greater loss in C value. Such a minor increase in diameter would probably pay a good dividend.

"Experience With Steel Pipe Lines After Lining in Place" by Wm. G. Banks, Engineer, Dir. of Water, Newark, N. J.

Mr. Banks reported an experience with the first large water main to be lined in place by machine, applying dense cement mortar centrifugally to a thickness of 3/8 to 7/16th inch which resulted in increased delivery by this transmission main to 80 mgd. from 62 mgd. before cleaning and lining. Based on this experience 6 other lining contracts had been let since the first contract some 11 years ago. Recently 10 in. square slabs of the 11-year-lining had been removed at four points for study and testing. Analyses revealed that lime had been leached for the 3/8 in. lining to a depth of not more than 1/8th of an inch. Adherence of the lining was surprising and tests of the slabs revealed a 750 lb. sq. in. strength. During the 11 years no leaks have developed and the only iron stain showing through the lining is found at the rivet heads. No reduction in flow capacity of the line has been observed during the 11 years and the conclusion advanced by Mr. Banks is that only the exterior corrosion of the steel pipe will determine the ultimate life of the rehabilitated line which appears certain to have a life of at least 40 years more.

W. R. La Due then told of the Akron experience on a similar project 8 years ago on twin 14 mile steel mains, apparently in much worse condition than the Newark line. Prior to lining by the same process as was used at Newark, no attempt was made at Akron to weld the pits since tests had shown that the dense 3/8 in. lining would bridge a hole 1½ inches in diameter and stand 200 lbs. pressure without cracking or leaking. Of equal interest was the revelation that the pipe lining machine would travel through and produce a satisfactory lining even where the pipe was out of round 5 to 7 inches. Tests on a 7700 ft. section of main revealed that the C value had been restored to 123 when figured on the actual diameter of the lined pipe or 116 when figured on the original diameter.

W. G. Banks
Chief Engr.
Dir. of Water
Newark, N. J.

B. S. Grant
Asst. Chief Engr.
Dept. Wtr. & Pwr.
Los Angeles

War Damage and Erosion Control

The fourth general session of the A.W.W.A. (Linn H. Enslow, Vice-Pres., presiding) was devoted to War Damage to Enemy Utilities, and Erosion Control in California.

Water System Design vs. War Damage

H. S. Swanson, Structural Eng. Assoc. of the Water Design Div., Dept. of Water and Power, Los Angeles, and S. A. Evans, Civil Eng. of the same department, presented a two-part paper on **"Lessons in Water System Design Derived from World War II."**

Mr. Swanson had been sent by the War Department to both Germany and Japan to study the effects of bomb damage. He presented a series of recently released pictures (slides) to show the effects of various kinds of bombs and types of bombing raids on structures of various types. Whereafter, Mr. Evans presented a series of suggestions as to how future design could be undertaken to offset this type of bomb damage.

Mr. Swanson showed effects on railroad bridges, viaducts, concrete houses, buildings, railroad yards, manufacturing buildings, and utilities. It was obvious from the pictures that the utilities, as designed in the past, are very susceptible to bomb damage. In Hiroshima 70,000 main breaks were recorded in the water system. In any future world conflict certainly damage to utilities is likely to be a highly important factor in the winning or losing of a war.

Mr. Evans presented several suggestions as to what should be done in regard to the future. He believes that preparedness is all important, but that there can be no thoroughly bomb-proof construction of utilities, and he suggests that we abolish mass destruction as a means of war. Mr. Evans also suggests that consideration of fires in bombed cities must be made paramount and that water tanks of the future should be buried to hide them as well as to protect them. He further suggests that structures in the utilities should be decentralized, and he made several detailed suggestions as to proper design for various utility structures.

Erosion Control

"Erosion Control in Mountainous areas in California" was the topic presented by C. J. Kraebel of the Div. of Watershed Management, U. S. Dept. of Agriculture, Univ. of Calif., Berkeley.

Speaking from notes and slides, Mr. Kraebel discussed the water situation in California in relation to mountainous areas. Forty-five million acres, or 45 per cent of the area are mountains and high snow acreage. Fourteen million acres, or 14 per cent, are agricultural and urban areas, and forty one million acres are desert sage and foothill grass. From these figures it is obvious that erosion from the mountains may well have an effect on the lower lands and their water supply.

Among the primary causes of erosion Mr. Kraebel listed the following in their order of importance: Fire, smelter fumes, road

construction, grazing, logging, placer mining, and lastly cultivation. By means of slides, Mr. Kraebel showed the effects of these several causes of erosion and methods of combating each.

W. C. Morse
Supt.
Water Dept.
Seattle, Wash.

L. J. Alexander
Chief Engr.
So. Calif. Wtr. Co.
Los Angeles

F. B. Blanchard, Senior Hydraulic Eng. of the East Bay Municipal Utilities Distr., followed Mr. Kraebel and discussed the **"Erosion Control in Watersheds of the East Bay Municipalities District."** The problem in this area, according to Mr. Blanchard, has been the slow, steady loss of reservoir capacity due to silting. In one reservoir the capacity was reduced by 23 per cent in 67 years, a loss of capacity of 54 acre feet per year. In another reservoir of younger age, the capacity lost was only 2.4 per cent in 17 years but at the rate of 57 acre feet per year. A third large reservoir had lost 4.2 per cent in 26 years at the rate of 65 acre feet per year.

To combat the loss of reservoir capacity, an erosion control program was begun in 1939. Mr. Blanchard described the number and type of structures built in this program, 109 structures being built on one reservoir alone. Most of these are of the dam and drop pipe system.

One of the means attempted to determine the effectiveness of erosion control was the study of turbidity, but Mr. Blanchard states that further study is needed before turbidity can be used as an index of erosion.

Reforestation has been used as a means of combating erosion and it is expected that the district will plant 100,000 trees a year. It is not the total number of trees planted, but the number of trees that survive that's important. Prevention of erosion includes the control of highway construction, the control of grazing, lumbering, and mining. Fire-fighting, too, is very important.

The erosion control program for the East Bay Municipal Utilities District has been in existence for too short a time for any long term point of view, but over a short period the initial phase of the program appears to be successful.

"Erosion Control in Watersheds of the Los Angeles Dept. of Water and Power" was discussed by B. S. Grant, Asst. Chief Eng. of Water Works, Dept. of Water and Power, Los Angeles. (Ed. Note: Unfortunately your reporter was called out of the room and missed hearing this paper.)

Radio in Water Works Operation and Maintenance

"Radio in Water System Operation and Maintenance"—by Adolph Damiano, Prin. Asst. Engr., Hackensack Water Co., Weehawken, N. J.

In the absence of Mr. Damiano this paper was presented by **B. A. Currie,** Communications Engr. of the Los Angeles Dept. of Water and Power. Constituting a report of the status of radio communications in the water supply industry, Mr. Damiano's paper pointed to the unaccountable slowness of water utilities to adopt radio communication and urged water supply officials to apply for assignment of wave bands now held open for utilities by the Federal Communications Comm., since a further delay in utilization of the channels might cause the allocation to be lost through assignment to other interests clamoring for channels.

Mr. Damiano called attention to the fact that regulations of the F.C.C. have been materially simplified, including the authorization to operate mobile sending and receiving equipment above 25 megacycles by non-licensed radio operators.

Mr. Currie reported that the Los Angeles Dept. of Water and Power began radio communication in 1937 and now has 25 two-way mobile units in service and a total of 106 units, stationary and mobile. He cited the tremendous saving in man-hours and costly delays resulting from two-way transmission and mobile units.

W. C. Morse, Supt., Seattle Water Dept., contributed much by way of discussion and encouragement to water and sewage works managers to adopt radio communication before too late to get in on the channels held open for public utilities. He pointed out that the regulations of the Federal Communications Commission are not involved and are easy to learn and follow. He referred to the guide to applicants for wave bands which is to be found in the December, 1946 issue of the *A.W.W.A. Journal* and also urged water works managers to make early application to the Commission for band allocation preliminary to selection of equipment at a subsequent time.

Mr. Morse said that experience had taught that the F.M. (high frequency) sets are more practical for water works than the A.M. (low frequency) sets because of less interference to F.M. transmission by power lines and the like. As to the expense of providing radio communication he cited Seattle's costs of $7400 for providing one master station, 7 fixed stations and the equipping of 42 cars and trucks with two way equipment. To equip each car or truck costs $550. The master station equipment costs $1250 and upkeep for all units about $695 per year. Considering the value of such a system to a public utility these costs appeared thoroughly justified.

"Inter-Industry Problems Derived from Cathodic Protection of Underground Structures," by **F. E. Dolson,** District Engr., St. Louis County Water Co., University City, Mo.

Mr. Dolson stated that some 3400 miles of metal pipe lines are now protected with cathodic protection. However, a problem has arisen in built up areas where pipe lines and cables are closely located or crisscross each other. The line protected suffers external pitting due to the leaving of current which jumps to any metal object in close enough proximity to the line carrying the otherwise protective current. Especially does this happen when pipe lines cross. The correction of this condition can best be handled through committees on which the several interested parties are represented. Often joint cathodic installations may be practical in which two or more pipe lines, conduits, etc. can be bonded to provide protection of both systems.

L. J. Alexander, Chief Engineer, Southern Calif. Water Co., Los Angeles, also advocated the committee

Dale L. Maffitt
Gen. Mgr.
Water Works
Des Moines, Ia.

Abel Wolman
Prof. San. Engrg.
Johns Hopkins U.
Baltimore, Md.

Amongst Those Attending the San Francisco Convention

D. D. Gross, Chief Engr., Water Board, Denver, Colo. — *Carl Duy, Engr. & Mgr., Water Dept., Aurora, Ill.* — *Nelson Eckart, Gen. Mgr., Water Dept., San Francisco* — *C. G. Richardson, Vice-Pres., Builders-Prov., Providence, R. I.* — *Brian Shera, Engineer, Pa. Salt Co., Tacoma, Wash.* — *J. C. Detweiler, Chief Engr., Met. Util. Distr., Omaha, Neb.* — *E. A. Cleveland, Chief Commr., Water District, Vancouver, B. C.*

method of solving this interference problem, but emphasized the fact that the obligation to make corrections would rest on the shoulders of those employing cathodic protection.

"Municipal vs. Residential Water Softening," by Dale L. Maffitt, Gen'l. Mgr., Des Moines, (Ia.) Water Works.

In considering the overall value of softened water to a community, Mr. Maffitt concludes his discussion of the question of water softening by the water utility in a central plant, as against the practice of leaving the softening to the water takers as individuals, by saying that as the water taker becomes educated to the fact that it is practicable for the water purveyor to produce and supply a water of reasonable softness he is going to eventually demand a softer water. Considering the many angles to the question, the service to the community of providing a water of moderate softness (say 85 ppm. hardness) can be reasonably expected of the public water utility. Any additional softening demanded by the water user should be provided by himself, when taking into account all considerations—not the least being the increased corrosiveness of tco highly softened water at a difficult-to-justify expense.

Mr. Maffitt emphasized the fact that there are now 750 communities which have made a mistake if centrally operated softening is a questionable and uneconomic practice, for this number of communities had adopted softening of the entire public supply and few if any have abandoned such practice in favor of softening by the water user.

The practice of Fort Dodge, Ia. was taken by Mr. Maffitt as an example of a municipality which operates a zeolite water softening service for individual water users. In this interesting experiment it is reported that 1500 of the 5500 water takers have availed themselves of this eight year old municipally operated softening service which has usually been provided by privately operated firms. The Fort Dodge records show that the cost to the water utility for providing this zeolite softening service has been on the average 51½ cents per customer per month. This figure, however, covers only the labor and regenerating salt required, and does not include depreciation or over-head of any nature.

With Regrets

It had been contemplated that this second installment of the reporting of the 1947 A.W.W.A. Convention proceedings would also include coverage of the Water Purification Division's Sessions. With considerable regret we find that space is available for only a portion of the report by Mr. Harry A. Faber covering the Water Purification Division Sessions, and rather than split the report between two issues the complete account will be printed in our November issue.

"Should Public Water Supplies be Used as a Means of Mass Medication?" by Abel Wolman, Prof. of Sanitary Engineering, Johns Hopkins University.

For this interesting and timely analysis of the pros and cons of attempting to medicate a community through the public water supply, and the pointed discussion which ensued in San Francisco, see Dr. Wolman's paper which appears in full in our September issue.

Glenn Searls Is Supt. of Sewage Treatment at Rochester, N. Y.

(A Correction)

On page 282 of the August issue of *Water & Sewage Works* there appears a picture of Wm. D. Denise of Rochester, N. Y., and the caption under the picture states that Mr. Denise is Superintendent of Sewage Treatment at Rochester, N. Y. This is an error; Mr. Glenn Searls is and has been for a long time the Superintendent of Sewage Treatment of the Rochester, N. Y., plant; Mr. Denise is and has been for several years, Supt. of Sewage Treatment of the Town of Greece, which is a suburb of Rochester.

We hasten to make this correction before any more confusion of the two results. We should have known better but were misled by the listing in *Sewage Works Journal* (March issue membership lists), which indicates Mr. Denise to be "Supt., Rochester, N. Y." Will you forgive us, Glenn and Bill?

Gilbert Associates Increase San. Engr. Staff

The Sanitary Engineering Dept. of Gilbert Associates, Inc., of Reading, Pa., has been increased in size, according to an announcement from the company.

Two new members of the staff are William E. Yoder and Kenneth Thompson. Yoder, a graduate of Penn State in 1940, spent four and a half years in the Navy as Engineering Officer on a minesweeper and Executive Officer of a Navy construction battalion. He was formerly with Wertz Engineering Co. of Reading, Pa., engaged in the design of industrial waste treatment plants for textile, milk plant, and laundry wastes.

Thompson, also a Penn State graduate in 1944, spent two years in the Army on petroleum control before joining Wiggert and Dean Engineering Co., Daytona Beach, Fla., where he was engaged in the design of municipal water and sewage plants.

The Sanitary Engineering Department is under the direction of R. W. Simpson, formerly of the U. S. Army Air Forces Engineering Dept. in Buffalo, N. Y.

PENNA. WATER WORKS OPERATORS HOLD 20th MEETING AT STATE COLLEGE

More Than 200 Attend Annual Sessions

ONCE again the Pennsylvania Water Works Operators' Assn. returned to its favorite meeting place, the campus of Penn State College, at State College, Penna. This was the 20th meeting and again the attendance topped 200 persons, most of whom participated in the golf tournament or baseball game. The ladies, of which there was a goodly number, enjoyed both a bridge and a bingo party, at which Mrs. John D. Roberts of Philadelphia acted as hostess.

Presidents

(Retiring)
Ted H. Kain, Mgr.
Columbia Wtr. Co.
Columbia, Pa.

(Incoming)
T. G. Braman, Mgr.
Citizens' Water Co.
Washington, Pa.

Featured, as in the past, were the two open house sessions at night, where "free lunch" was evident in abundance. Music at these sessions consisted of trumpet tooting by Reg Adams of Wilkinsburg, the piano playing of William (Penn Salt) Snelsire, and that "Tarradiddle Joe" drumming, Ted H. Kain. Also featured again were the door prizes at each session, from one of which your reporter came away with a very neat carving set.

Although the paid entertainer for one evening session fell ill, the repeat performance of Mr. I. Q. with the silver dollars was a hilarious success. Naturally, the Secretary-Treas. of the organization, **I. M. Glace,** Cons. Engr. of Harrisburg, acted as **Mr. I. Q.,** giving out dollars for correct answers to the lucky or unlucky persons picked from the audience by John D. Roberts and E. A. Sigworth.

Chairmen

R. Y. Sigworth
Supt. of Utilities
Pa. State College
(Local Arrangmts.)

P. M. Hess
Station Supt.
Safe Harbor, Pa.
(Nominations)

In appreciation of the efforts of Mr. Glace over the years as Secretary and guiding force of the organization, the members presented him with a very attractive wrist watch, much to his surprise.

Business Session

At the annual business meeting the following officers were elected to serve for the ensuing year:

President
T. G. Braman, Manager,
Citizens Water Co.,
Washington, Pa.

Hosts

Hugh B. Rice
Borough Mgr.
State College, Pa.

J. O. Keller
Asst. to Pres.
Pa. State College

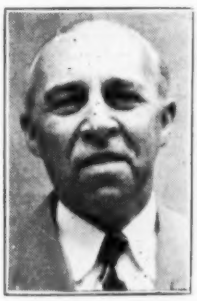
First Vice President
C. P. Abraham, Supt.,
Bureau of Water, Lancaster, Pa.

Second Vice President
George W. Naylor, Supt.,
Punxsutawney Water Service,
Punxsutawney, Pa.

Secretary-Treasurer
I. M. Glace, Cons. Engr.,
Harrisburg, Pa.

By unanimous vote it was decided to establish honorary memberships and the matter was assigned to the executive committee. The secretary reported an ample bank balance and an increase in membership in spite of a loss of several members by death.

J. R. Hoffert explained plans for a short school to be sponsored by the State Dept. of Health and Penn. State College and the Penna. Water Works Operators voted to join the sponsorship of the short school. Details for the first school will be announced later.



Vice-Pres.
Chas. P. Abraham
Supt. of Water
Lancaster, Pa.

Secy.-Treas.
Ivan M. Glace
Consulting Engr.
Harrisburg, Pa.

Chlorination Practice and Demonstrations

A. E. Griffin, Director of the Technical Service Division of Wallace & Tiernan Co., reviewed chlorination progress since 1940, beginning with the break-point process, through the various differentiation tests, to the modern terminology, wherein there are only two types of chlorination (combined-residual- and free-residual-chlorination).

Mr. Griffin mentioned the various tests, the Laux Flash Test, the Methyl orange test, and the Hallinan-Gilcreas O.T.A. Test, and emphasized the fact that free available chlorine is a much better and faster bactericide. It also will increase filter runs, bleach color, aid coagulation, and eliminate algae, if used properly.

Programmers

M. C. Smith
Chief Engr.
Public Utilities
Richmond, Va.

J. W. Heiney
Manager
Water Serv. Corp.
Palmyra, N. J.

A Breather Between Sessions

Paul Gill, Engr. Clearfield Coal Corp. Indiana, Pa.

San. Engineering Faculty
B. A. Whistler (Head of C. E. Dept.)
R. E. Stiemke (Prof. San. Eng.)
R. R. Kountz (Asst. Prof. San. Eng.)

J. L. Atwell, Sales Mgr. A. P. Smith Mfg. Co. East Orange, N. J.
and
R. L. Kelley, Distr. Mgr. Northrop & Co. Spring Valley, N. Y.

Another Breather Between Sessions

During the presentation, demonstrations of color reactions using ortho-tolidine, ortho-tolidine and arsenite, and methyl orange were made by **N. S. Chamberlin** of the Tech. Service Div. of W & T. Mr. Chamberlin demonstrated the Flash Test, the effect of manganese on the ortho-tolidine reaction, the effect of too little ortho-tolidine reagent in the sample, the ortho-tolidine arsenite test to determine free and combined residual chlorine, and interfering substances. This evening session was presided over by T. H. Kain, president of the association.

Production and Maintenance of Water Quality

Under the presiding gavel of **C. P. Abraham,** Supt. of the Bureau of Water, Lancaster, Pa., and Second Vice Pres. of the Association, the first morning session was a round table discussion on the "Production and Maintenance of Water Quality." The leader of the discussion was **Marsden C. Smith,** Chief Engineer, Dept. of Public Utilities, Richmond, Va. This was a follow-up on the paper presented by Mr. Smith at State College in 1946 and as preliminary to several five-minute prepared discussions of that subject, Mr. Smith reviewed the paper which he presented at that time.

Mr. Smith pointed out that the science of the preparation of water had advanced faster than had the maintenance of quality after the water leaves the filter plant, but the public judges water at the tap and not from filter plant records. Therefore, it is essential that the water quality be maintained.

At Richmond the first attempt to maintain this quality was treatment to reduce the organic matter content of the water to the lowest possible level before the water enters the distribution system. Super-chlorination is utilized and enough chlorine is added to require a sulfur dioxide de-chlorinating treatment after 14 hours of contact.

Then the Richmond plant developed what is known as double coagulation, which combines alum dust in summer and iron sulfate dust in winter, sometimes both being used. pH is adjusted if necessary. So long as sulfur dioxide and chlorine are used on the filters, the sand remains clean and filter runs up to 120 hours have been obtained while the filter rates are at the rate of 3 gal. per sq. ft. per minute.

A. A. Estrada, Engineer, Albright & Friel, Inc., Philadelphia
Geo. W. Naylor, Manager, Punxsutawney (Pa.) Water Co. (Elected 2nd Vice-Pres. of the Association)
John D. Roberts, Treasurer, Roberts Filter Mfg. Co., Darby, Pa.

Mr. Smith maintains 2.0 ppm. residual chlorine to keep the water good. Ammonia is added to get a persistent chloramine residual through the system. Hydrated lime is used to bring about a slight phenolphthalein alkalinity which prevents iron corrosion. And lastly, copper sulfate is added to keep algae down in reservoirs and to keep algae growth down in the distribution system. It was found that fish can tolerate more copper in water at low pH than at the higher pH. The copper sulfate dosage is at the rate of 0.25 ppm. of copper.

In addition to this chemical treatment, the mechanical design of the distribution systems was revised so that water does not lie for long periods in large mains. Feeder type headers are used. No hemp or jute is used in the joints of the mains or feeders, lead-tipped rubber and mechanical joints being preferred. Mr. Smith prefers concrete lining for mains and cautions that oversize mains should be avoided, particularly in outlying areas. Although all of these efforts may add to the cost of the water, it appears worth it from the standpoint of consumer and consumer acceptance, and all in all it adds up to good public relations.

The first discussor of the paper was **R. B. Adams,** Chemist, Wilkinsburg-Penn Joint Water Authority, Wilkinsburg, Pa.

Mr. Adams said that their distribution system had heavy deposits of iron and manganese over a period of years and that these used up the residual chlorine. The first improvement was iron removal by adjusting the pH and prechlorination and flocculation to reduce the iron content to 0.1 ppm., but then the iron in the distribution system increased and it was necessary to raise the pH in the summer to knock out the manganese.

E. O. Horner, Div. Mgr. Municipal Managem't Co. LeMoyne, Pa.
and
D. E. Keller, Mgr. City Water Authority Hazleton, Pa.

Thos. Douglas, Engr. W. Penn. Water Co. McDonald, Pa.
and
J. Z. Columbia, Chemist Langelot Water Co. Langelot, Pa.

W. P. Johnson, Supt. Bureau of Water Easton, Pa.
and
Jim Griffiths, Mgr. Munic. Authority New Kensington, Pa.

W. O. Weisel Supt. of Public Works Doylestown, Pa.
and
L. Consor Chief Operator Doylestown, Pa.

J. P. Durr, Asst. Engr. State Dept. of Health Meadville, Pa.
and
C. J. Stroemple, Engr. Columbia Chemical Div. Barberton, Ohio

J. R. Hoffert and Charlie Young Pa. State Dept. of Health

Fred Leopold, Mgr. and F. L. Davis, Engr. F. B. Leopold Co. Pittsburgh, Pa.

C. E. Palmer, Pres. Palmer Filter Equip. Co. Erie, Pa.

"Friends of President Kain from Lancaster County" Leon Duckworth Production Supt. and Ben Brock, Mgr. Suburban Water Co. Lancaster, Pa.

Al Frank and R. L. Hardman of Nat'l. Water Main Cl. Co.

J. L. Atwell of A. P. Smith Co.

R. G. Counselman of Centriline Corp. New York

A Typical Discussion Circle

Mr. Adams used hexameta-phosphate to stabilize the pH and help maintain the chlorine residual, but it was found that deposits of iron broke off. Eventually though the material stopped sloughing off and hydrant flushing was used to keep the mains clean.

Some persons thought that variable pH caused a softening of deposits so they stopped the phosphate treatment. They now have a more stable pH in the water and the chlorine-carrying capacity is better. It is still not enough, although iron pickup is low and manganese deposits are practically nil.

It was found that the small lead lines to meters were plugged and needed cleaning after beginning the program of treating the water to improve its quality. Meters began to corrode. Whereas they used to have deposits of iron and manganese on the meter parts, this does not occur and beginning in 1944 there has been an increase in the number of non-working meters. This increase began at the outskirts of the city and is working gradually back toward the filter plant. Most of the non-working meters are among those which were cleaned and repaired in the past year. There is not much mechanical failure, but the brass shows dezincification with deposits of zinc on the gears, and galvanic corrosion with a deposit of calcium carbonate is observed. This is thought to be occasioned because there is no longer any manganese plating out on the meters to prevent corrosion.

R. W. Hayden Chemist Water Authority Oakmont, Pa.

J. O. Fulmer Chemist Bureau of Water Easton, Pa.

Elwood L. Bean Prin. Asst. Engr. Bureau of Water Philadelphia

Harry J. Krum Chief Chemist Bureau of Water Allentown, Pa.

Programmers

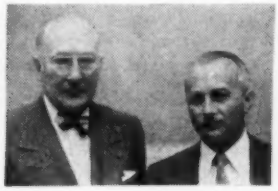
Geo. R. Taylor Chemist S. Spring Brook Co. Scranton, Pa.

A. E. Griffin Tech. Service Wallace & Tiernan Newark, N. J.

Elwood L. Bean, Prin. Asst. Engr. of the Bureau of Water, Philadelphia, Pa., said that when the pH of the water was raised it reduced iron pickup and lead pickup. Metaphosphates were also a help. Other factors besides the control of alkalinity and pH are important. It is essential to get rid of carbon dioxide and hydrogen sulfide. The presence of aluminum or magnesium chloride will cause corrosion. Nitrates and sulfates should be dispensed with if possible as they act as bacterial food. Since it is difficult to remove these, the bacteria must be controlled by chlorination. Mr. Bean says that each system needs its own study, but that in general an open reservoir should be dispensed with, and he summed up his discussion by saying that not only is pH control needed, but there must be a minimum of organic compounds in the water, a good distribution system, and proper chlorination.

J. O. Fulmer, City Chemist, Bureau of Water, Easton, Pa., explained why at his plant it is necessary to maintain a high chlorine residual because of open reservoirs and long contact time. Dosage was at 80 lb. of chlorine per mil. gal. Now with ammonia and chlorine dosages of 6.6 to 7.2 ppm. the residual at the plant is from 2 to 4 ppm. After 2-day detention in res-

"Al" Frank, Manager and "Bob" Hardman, Engr. Nat'l Water Main Cl. Co. New York



Ed C. Trax, Supt. Filter McKeesport, Pa. and Earl Schwaln, Mgr. Gettysburg Water Co. Gettysburg, Pa.

"Bill" Schnabel, Supt. Allentown Water Dept. and "Jo" Hayes, Distr. Mgr. Neptune Meter Co. Camp Hill, Pa.

Jo Acker, Sales Engr. R. D. Wood Co. Philadelphia and Frank Milne, Distr. Mgr. Hersey Meter Co. Boston

M. C. Smith, Chf. Engr. Dept. of Public Utilities Richmond, Va. and Wm. J. Murdoch Consulting Engineer Pittsburgh, Pa.

ervoirs the residual is considerably less.

To maintain quality in the mains, lime is added to pH of 8.7 to 9.0 (29 ppm. alkalinity). The pH drops to 8.0 in the system and there is a tendency to corrosion. This is accentuated by the presence of chlorine which reacts with the lime to produce calcium chloride, a salt which contributes to corrosion.

Mr. Fulmer presented several reactions which might be expected to occur with chlorine at different pH levels, and showed how some side effects might be expected, but high chlorine residuals are an effective bactericide with no tastes.

R. W. Hayden, Chemist, Oakmont Water Authority, Verona, Pa., told of cloudy water occurring in one dead end section. Looping the mains helped, but not for long. Blowing off of fire hydrants was practiced first once in three months, then more and more frequently until even twice a week was failing to maintain a clear water. The color of the water was 30 ppm., the pH was 6.7, and the iron and manganese contents were 3.0 and 0.1 ppm., respectively.

As a corrective treatment, sodium hexa-metaphosphate was added and after six months of sloughing the color of the water was reduced to 3.0 ppm., iron to 0.05 ppm., and pH 7.6. After the good results obtained in the rural areas, Mr. Hayden adopted the phosphate treatment for the whole system but warned that care should be used with phosphate additions where open reservoirs exist.

B. F. Johnson, Chemist, New Castle Water Co., New Castle, Penna., said that by adding lime just ahead of the filter the manganese would be removed on the filter sand. At this plant, the coagulating effect on the filter is different than at other plants. The pH of the applied water is 8.0 but the pH of the filter effluent is 7.6. This treatment has been successful for several years, but overdoing the treatment causes the filters to build up.

The discussion by **George D. Norcom,** Cons. San. Engr. and Chem., Red Bank, N. J., was read by I. M. Glace. Mr. Norcom is of the opinion that open reservoirs should be covered, and that corrosion is the cause of tuberculation. Mechanical cleaning is not permanent, new linings are "okeh," but for old lines relining appears warranted, according to Mr. Norcom.

Programmers

R. B. Adams
Supt.
Jt. Wtr. Authority
Wilkinsburg

Geo. E. Symons
Assoc. Editor
"Wtr. & Sew. Wks."
New York

G. R. Taylor, Chemist, Scranton-Spring Brook Water Service Co., Scranton, Penna., believes water needs chemical study. "We have been too concerned with rendering water safe to worry about the water to the consumer," said Mr. Taylor, who raised the question as to the effect of chlorine (in the water) on hot water tank corrosion.

"Silent Service Is Not Enough"

On the subject of Public Relations, **George E. (Doc) Symons,** Assoc. Editor, *Water & Sewage Works,* emphasized the slogan of the Amer. Water Works Assn., that for water works personnel, "Silent Service Is Not Enough." Water works superintendents and managers should do everything possible to publicize their problems, their goal, and their policies so that the employees, the consumers, and the owners (or political administration) would fully understand. Proper publicity, employee activities, lucid and interesting annual reports are but a part of a good public relations program. Dr. Symons illustrated his talk with stories and anecdotes from his own experience.

Employer-Employee Relationships

J. W. Heiney, Div. Mgr., New Jersey Div. of the Water Utilities Service Corp. in Palmyra, N. J., said his company wanted only employees who are sociable, and that it strives to keep its employees happy. The company seeks to raise salaries wherever warranted and it seeks to give opportunity for all employees to improve their positions. In its actions the company strives to recognize the individual as a person, not just as an employee. Mr. Heiney admitted that in the one plant where a union had been established, relations were good but had changed from personal to impersonal.

Among the many benefits provided employees are job security, overtime pay, vacations, holidays, hospital and accident insurance, a flexible retirement plan. Bowling leagues, even interplant bowling matches, are fostered; the company gives everyone the same Christmas present and maintains an apartment at Ocean City, N. J., for the vacation use of employees.

Mr. Heiney emphasized the need for good employer-employee relations and the practices which he described embodied many of those which Dr. Symons had discussed as desirable.

Value of Metering to a Community

W. S. Andrews, Dist. Mgr. of the Rockwell Mfg. Co., Pittsburgh-Equitable Meter Div., Pittsburgh, told of the contest his company had held for the best jingle and the best essay on "100 Per Cent Metering Pays." Some 5,000 entries were received and the winner of the third prize was **T. H. Kain,** Gen. Mgr., Columbia Water Co., Columbia, Penna., and retiring president of the Association.

R. J. Counselman
Engineer
Centriline Corp.
New York

Ralph L. Tyler
Asst. to Pres.
Water Util. Service
Camden, N. J.

Jas. G. Griffiths
Manager
Water Authority
NewKensington,Pa.

Wm. R. Schnabel
Supt. of Water
Allentown, Pa.

Max U. Priester
Asst. Director
W. [illegible] & L. D. Betz
Phila., Pa.

J. W. Lawrence
Manager
W. Pa. Water Co.
McDonald, Pa.

O. A. Newquist
Manager
Muncie Water Co.
Muncie, Ind.

For his essay Mr. Kain drew on personal experience and experiences elsewhere. The metering program was begun in Columbia in 1927. Cost of the program was $38,100 and the additional annual operating cost of the metered system over flat rate was $6,200. With metering, the per capita consumption dropped from 53 to 41 gpd. and the cost per million gallons filtered was cut from $39.00 to $28.00 per month. (Some of this reduction was due to improved operation.)

Within a short time consumer resistance to metering disappeared and now there are no complaints except for high bills which are usually traced to leaks. Adjustment is made if the leak is corrected before the following month. Of 2,816 consumers (90 per cent have toilets and baths), 1,275 receive monthly bills of $0.50 to $1.00, and 862 of less than $1.50.

Not only has 100 per cent metering paid in Columbia, but Mr. Kain cited instances and reports from many sources to show the benefits of metering.

FLUORINE DETERMINATION IN WATER, USING AN ELECTROPHOTOMETER

By A. R. TODD,
Supt. Filtration & Purif.
WARWOOD FILTRATION PLANT
WHEELING, W. VA.

THE use of an electrophotometer instead of matched Nessler tubes in Sanchi's Method, as modified by Scott (Standard Methods) in fluoride determinations will be of interest. The instrument referred to in this paper is "Fisher's A.C. Model Electrophotometer."

It was thought at the time of purchase of this instrument that a graph could be prepared from standards and from then on it would be a simple matter to treat the unknown with 5 ml. of reagent, allow to stand one hour, then take the reading, look on the graph and tell how much fluorine was present. It was found, however, that it was not as simple as all that because the reagent, instead of being "fairly stable" as indicated with the naked eye, changes occurred from day to day. Inasmuch as a unit change in concentrations of relatively strong fluoride solution results in a smaller change in color than the same unit change for comparatively weak solutions, it was found necessary to run a set of standards along with the unknown samples at least daily. The accompanying table shows the results obtained in two experiments six days apart, using the same standards made from the same solution and the same reagent. Also shown is the average instrument reading for several sets of standard solution.

From the data in this table it appears the electrophotometer is not sensitive below 0.1 ppm. In running more than 450 determinations of known fluoride content we have come to the conclusion that fluorine cannot be detected in water in concentration less than 0.07 ppm.

The data in the table also indicate that a constancy of instrument readings for specific fluoride contents is not obtainable. Furthermore, incremental readings for equal incremental fluoride contents are not constant. These variations are ascribed in part to personnel reading errors and in part to sensitivity of the instrument. Regardless of the reading difficulty, it is obvious from a comparison of the readings on the same standards (six days apart) that standards and reagents must be checked daily.

After six months of daily determinations of fluorides the following conclusions are noted:

(1) Use Filter No. 525 Green with a spectral band transmission of 525 millimicrons or 5,250 angstroms. Blue filter No. 425-B is recommended for red, pink, orange and yellow, but it will not work with the red color developed with the reagent in fluoride determinations.

(2) The method is inaccurate below 0.45 ppm., and the zone of extreme accuracy is between 0.45 and 1.2 ppm. where the error is only ± 0.07 ppm. Between 1.2 and 1.4 ppm. the accuracy is ± 0.2, as it is when the fluorine content is less than 0.45.

(3) The electrophotometer is more accurate than the use of Nessler tubes but standards must be checked daily.

(4) Differences in color not detected with the naked eye are readily shown on the electrophotometer.

(5) Eleven standards and twelve unknowns can be determined in 1½ hours.

(6) Free residual chlorine interferes with fluoride determinations. Chlorine of 1.0 ppm. will show the equivalent of 1 ppm. fluoride. One drop of 10 per cent sodium arsenite solution will destroy the chlorine but the fluorine determination will still be 0.1 ppm. too high.

When chlorine in the amount of 1.0 ppm. is destroyed by adding 5 ml. of a 5 per cent solution of potassium iodide solution plus sufficient 0.1 N sodium thiosulfate (added to destroy the iodine) will show an equivalent of 0.1 ppm. of fluoride.

(7) Samples and reagents must be the same temperature.

Fluorine Content ppm.	Electrophotometer Instrument Reading			
	Avg. Several Sets of Stds.	Same Standards 5-20-47	Same Standards 5-26-47	Change
0.0	88.9	87.5	84.2	3.3
0.01	88.9	...	...	..
0.02	88.9	...	...	..
0.03	88.9	...	...	..
0.04	88.9	...	...	..
0.05	88.9	...	...	..
0.06	88.9	...	...	..
0.07	88.9	...	...	..
0.08	88.9	...	...	..
0.09	88.9	...	...	..
0.10	88.9	88.3	84.5	3.8
0.15	90.0	...	...	..
0.20	90.0	88.2	85.0	3.8
0.25	90.0	...	...	..
0.30	90.0	89.3	85.8	3.5
0.35	90.1	...	...	..
0.40	90.1	89.7	86.6	3.1
0.45	90.4	...	...	..
0.50	90.8	90.8	87.1	3.7
0.55	91.3	...	...	..
0.60	91.6	91.3	87.7	3.6
0.65	91.8	...	...	..
0.70	92.1	92.2	88.6	3.6
0.75	92.4	...	...	..
0.80	92.8	93.2	89.9	3.3
0.85	93.2	...	...	..
0.90	93.6	94.3	90.4	3.9
0.95	93.8	...	...	..
1.00	94.6	94.5	90.7	3.8
1.10	95.3	...	...	..
1.20	95.4	96.2	93.6	2.6
1.30	95.6	...	...	..
1.40	95.9	96.6	94.3	2.3

TASTE AND ODOR CONTROL IN WATER PURIFICATION

(A Book Review)

A NEW book on *Taste and Odor Control in Water Purification* is now available for the asking. Even if offered for sale it would be well worth the usual price of a 164 page book because water works managers, superintendents, chemists, and engineers will find it of particular value in connection with taste and odor control.

This book, which contains twelve chapters, a bibliography of 1063 references, and both an author and subject index, is a compilation of contributions by various authors and by technical representatives of Industrial Chemical Sales Division of West Virginia Pulp and Paper Co., which has published the book.

Historical Discussion

The volume opens with an historical discussion of ancient and modern water supplies. Written by Prof. W. W. Hassler, of Ogontz College, Rydal, Pa., this chapter sketches the struggle for water from primitive man, through the early Roman water supplies and the middle ages to the beginning of modern water purification with the introduction of the slow sand filter at the Chelsea Works in England in 1829. As a logical ending to this chapter the story is told of the adoption of activated carbon as a means of removing tastes and odors and increasing palatability.

In the second chapter, Prof. A. M. Buswell, of the University of Illinois and Chief of the Illinois State Water Survey Division, discusses the part industrial wastes play in the sources of taste and odor pollution in water supplies. This is followed by comments on pollution from natural sources, particularly algae, written by George J. Turre, San. Engr. of the Bd. of Water Commissioners, Denver, Colo. This section by Mr. Turre contains photomicrographs of common algae, descriptions of algae groups and their individual effects on producing tastes and odors in water supplies. The second chapter also contains a section on the use of activated carbon for preventing the growth of algae in open settling basins and reservoirs. This section on "blackout of algae" was written by H. O. Hartung, of the St. Louis County Water Co.

Chapter III deals with the Threshold Odor Test, giving the general principles and details of technic. Chapter IV is devoted to the effect of water treatment processes on tastes and odors. Aeration, sedimentation, coagulation, and filtration are included in this discussion.

Activated Carbon

Chapters V to X inclusive are devoted to activated carbon, its manufacture, use, points of application, methods of evaluating, and methods of determining required dosage. For persons working with water supplies subject to tastes and odors, these chapters give explicit directions on how to handle, store and feed activated carbon, how to determine dosages, where to apply activated carbon in reservoirs and basins, and other details of interest. Chapter X presents a discussion of granular carbon filters in municipalities by Louis B. Harrison, Supt. of Filtration, Bay City, Mich. Durando Miller, Research Engineer of the Permutit Co., discusses this same type of filter (granular) for domestic and industrial uses.

Other Methods of Control

Chapter XI contains discussions of five other methods of odor control, each written by a different author. Charles R. Cox, of the N. Y. State Dept. of Health, describes and discusses the chlorine-ammonia treatment of water and the factors which influence the choice and application of the treatment as well as the details of dosages, residual concentrations, and control tests. A. E. Griffin, Director, Tech. Serv. Div., Wallace and Tiernan Co., has written about the break-point process of free residual chlorination, and J. D. MacMahon and R. N. Aston of Mathieson Alkali have presented a description of the use of chlorine dioxide in taste and odor control. The use of ozone for taste and odor control is discussed by Stanley Jenks, Director of Trade Relations, Ozone Process, Inc., Philadelphia, and experiences with high pressure aeration are described by Lawson Haynes of the West Virginia Water Service Co., at Charleston, W. Va.

Bibliography on Tastes and Odors

Chapter XII is devoted to a discussion of Aqua Nuchar, the particular activated carbon manufactured by the Industrial Chemical Sales Div. Chapter XIII, prepared by John W. Hassler, contains the 1063 references to taste and odor control articles mentioned above. This is one of the most complete bibliographies available on the subject and is followed by a unique feature in books of this type, an author index and a subject index of the bibliography. This feature makes it possible for the reader to easily locate articles on various topics associated with taste and odor control or to locate articles by individual authors. The book concludes with an index of contents.

The preparation and presentation of this book on the subject of Taste and Odor Control in Water Purification should be received with considerable interest by all persons concerned with the problems of water supply. The company which has issued it is to be congratulated on making it available at no cost. Persons desiring this book should address a request to the Industrial Chemical Sales Div., West Virginia Pulp and Paper Co., 230 Park Ave., New York 17, N. Y. (G. E. S.)

San Diego Wins Award for Water Supply Program

The John N. Van Der Vries awards made annually to chambers of commerce associations performing outstanding services to their communities, were presented at the National Institute for Commercial and Trade Executives by President Earl O. Shreve of the National Chamber of Commerce.

For large chambers of commerce the first award went to San Diego for its program to develop an adequate water supply; second award was made to Indianapolis for a long range public improvement program within the present tax structure.

The fact that a chamber of commerce was made an award for a program to develop an adequate water supply underscores again the need for and the benefits of a good public relations program of any water utility.

PENNA. SEW. WKS. ASS'N. COMES OF AGE AND CHANGES NAME

Becomes Penna. Sew. and Ind. Waste Ass'n at 21st Annual Meeting at State College

RETURNING to State College, Pa., for the second time since the war, the Pennsylvania Sewage Works Association celebrated its coming of age at its 21st birthday by changing its name to the Pennsylvania Sewage and Industrial Waste Association. Thus the Pennsylvania group follows the lead of Virginia and Kentucky-Tennessee in adopting a name which makes obvious the place for industrial waste chemists and engineers in sewage works associations.

Presidents

(Incoming) *Norman G. Young, Borough Manager, Phoenixville, Pa.*

(Retiring) *Wm. J. Murdoch, Consulting Engr., Pittsburgh, Pa.*

Two hundred twenty-nine registrants were welcomed to the college by B. A. Whistler, Prof. of Civil Engineering, who emphasized the importance of operators in the field of sewage treatment. Two hundred twelve diners enjoyed the annual banquet, at which both Francis Friel, President of the Fed. of Sewage Works Associations, and L. D. Matter, Director for the Penna. Association, spoke. Entertainment for the evening consisted of a display of prestidigitation by Lloyd Nelson, Eastern Manager of the U. S. Pipe and Foundry Co.

Programmers

John W. Hood, Supt. Treatment Works, Ridgewood, N. J.

G. A. Rohlich, Assoc. Prof. Univ. Wisconsin, Madison, Wis.

A softball game (which was won by the "old men") was in charge of D. Paul Rogers, Chemist of the Penna. Dept. of Health. Many persons not playing softball played golf on the nearby course.

The meeting opened with an evening session at which James Stokley of the General Electric Co., Schenectady, N. Y., presented a talk on "Science Remakes the World." A number of demonstrations of electrical phenomena were shown. Of particular interest was a demonstration of a mechanical device consisting of some 48 mousetraps to show how the atom bomb works.

The local arrangements and entertainment were under the direction of R. Y. Sigworth, Supervisor of Utilities at Pennsylvania State College; R. R. Kountz, Assistant Professor, Sanitary Engineering, of the college, and R. J. Reese, Engineer of the Western State Penitentiary, Rockview.

Federation President

Francis S. Friel, Consulting Engr., Philadelphia

National Director

L. D. Matter, State Dept. Health, Harrisburg, Pa.

Business Meeting

In addition to changing the name of the organization, the officers for the ensuing year were elected as follows:

President
Norman G. Young, Manager
Borough of Phoenixville, Penna.

First Vice President
Charles H. Young, Dist. Engr.
Penna. Health Dept., Meadville, Penna.

Second Vice President
E. T. Roetman, Engineer
American Viscose Corp., Philadelphia

Secretary-Treasurer
Bernard S. Bush, Dist. Engr.
Penna. Health Dept., Wilkesbarre
L. D. Matter remains as Director

Vice-Pres.

Chas. H. Young, Distr. Engr. State Dept. Health, Meadville, Pa.

Secy.-Treas.

Bernie S. Bush, Distr. Engr. State Dept. Health, Wilkes-Barre, Pa.

for the Association, and J. R. Hoffert and Francis S. Friel were re-elected respectively as Editor and Program Chairman.

B. S. Bush, Secretary, reported that the Penna. Association gained 79 new members last year and now has a total membership of 312.

Progress in Sewage Waste Treatment

A short "Review of Progress in Fields of Sewage and Industrial Waste Treatment" was presented by **George E. Symons,** Associate Editor, *Water & Sewage Works,* New York City. Dr. Symons stated that there had been no basic changes in the four principal methods of sewage treatment; that is, in primary treatment, secondary treatment, disinfection, and solids disposal; but there have been some new equipment items introduced within the past

Programmers

F. W. Mohlman, Chief Chemist, Chicago San. Dist., Chicago

Geo. E. Symons, Assoc. Editor, Water & Sew. Wks., New York

Here and There at State College

Industrial Waste Session — *Friel, Mann & Boone* — *Sewage Treatment Session* — *John Hood and O.R.P. Equipment* — *Kappe, Boone & Longley*

year or two for the improvement of these processes. Settling tanks with improved sedimentation, two in one trickling filters for small biofiltration plants, programmed control for chlorination, and external heating devices for sludge digestion tanks were a few of the new equipment items which have appeared on the market within the past two years.

Dr. Symons remarked on the decreasing number of patents being issued on sewage and waste treatment, a condition that reflects a decrease in research during the war. Industry-wide attack on stream pollution problems and the trend towards acceptance of the doctrine that industrial waste treatment is a legitimate cost of production, as well as the interest shown by industrial waste workers in the Sewage Works Association, are healthy trends which may result in considerable improvement in stream pollution, regardless of the passage or non-passage of the perennial anti-pollution laws in Congress.

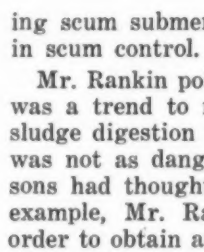
Changing character from that of editor to that of columnist, "Doc" Symons read a preview of his "column" on the trip to the San Francisco Convention and wound up his presentation with a few illustrative anecdotes from his after-dinner talk titled "The Audience Talks Back."

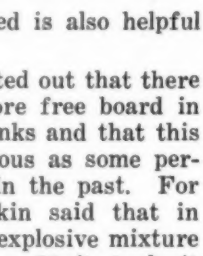
Sludge Digestion and Scum Disposal

R. S. Rankin, Asst. Mgr., North American Division, Dorr Co., gave a brief review of his discussion of scum control in digesters as presented at the Toronto meeting of the Federation last year, and then proceeded to present a new approach to the fundamentals of sludge digester capacity and operation.

Mr. Rankin pointed out that materials which cause the formation of scum in digesters may be classified as (1) grease and oil; (2) mat forming materials; (3) miscellaneous indigestible material; and (4) gas lifted sludge. Basically this means that there are two types of scum forming materials, nondigestible and digestible. If possible, non-digestible material should be kept out. Keeping scum submerged is also helpful in scum control.

Mr. Rankin pointed out that there was a trend to more free board in sludge digestion tanks and that this was not as dangerous as some persons had thought in the past. For example, Mr. Rankin said that in order to obtain an explosive mixture under the cover in a 50 ft. tank, it would be necessary to draw the liquid down 5 ft., and this is not likely to occur. Mr. Rankin also commented on the trend towards external heating and on the size of digesters. Digester performance and capacity provided must consider the amount of sludge removed as well as the amount of sludge added. Mr. Rankin made a study of twelve plants having pre-war data and calculated the input, output, and gas production. He then plotted the total dry solids in pounds per cubic foot per month as compared with the volatile matter reduction. Thereafter he plotted the pounds of volatile matter per cubic foot per month as compared with the volatile matter reduction. Thereafter he plotted the pounds of volatile matter per cubic foot per month compared with volatile matter reduction. Mr. Rankin observed that volatile matter reduction was the most important. He could not find any relation between the per cent reduction of volatile matter and the pounds of dry solids or the pounds of volatile matter added per cubic foot per month. So he approached from another viewpoint and made comparisons with the wet volume added. Mr. Rankin was able to obtain relatively straight sloping lines for different volatile matter contents and different dilutions, from which he developed a relation between the volume required in the digester and the detention time.





Programmers

R. Steve Rankin, Asst. Div. Mgr., The Dorr Co., New York

Jo J. Gilbert, Mgr. San. Div., Link-Belt Co., Philadelphia

Mr. Rankin's paper was discussed by **J. J. Gilbert,** engineer in charge of Sanitary Engineering Div., Link-Belt Co., Philadelphia, Pa. Mr. Gilbert favors the removal of waste at the industry where such waste produces non-digestible scum. He mentioned grease, oil, and hair in particular. Mr. Gilbert stated that submergence of scum was not the only answer to scum control, and he suggested that the breakup of the scum would cause the digestible scum to sink but not the non-digestible which must be removed by hand, and he pointed to several installations where a straight line scum breaker was effective in these cases. Mr. Gilbert also emphasized that most gas explosions which have been reported in or near sewage digester tanks have been the result of carelessness, not a matter of design.

In regard to digester loading, Mr. Gilbert commented on Mr. Rankin's paper by citing the results of seven army plants which showed highly variable results as to detention time, loading, and per cent reduction of volatile matter. These results would lie far below the curves shown on Mr. Rankin's chart. Mr. Gilbert had no answer but raised the question as to why the difference between those results and the indication of Mr. Rankin's data. No immediate answer was forthcoming from the group although effect of temperature, composition of sludge, and other variables were mentioned.

High Rate Filter Performance

Dr. F. W. Mohlman, Director of Laboratories of the Sanitary District of Chicago, summarized the operation of high rate filters as reported in the National Research Council studies of the operation of army sewage plants. These data were presented in the September, 1946, issue of *Sewage Works Journal* but were not in summary form.

Dr. Mohlman pointed out that these filters were divided into groups for summarizing purposes and these groups were according to design and operation. There were single deep filters, single stage deep filters with recirculation, shallow filters, with recirculation, and two stage filters. The operating results at these various plants are shown on the accompanying table.

Operating Results—Military Trickling Filter Plants

No. of Plants	Group Designation	B.O.D. Load Range Lb./Acre-Ft.	B.O.D. Removal — % Efficiency: Filters Plus Sec. Settling	B.O.D. Removal — % Efficiency: Over All Plant
4	Deep—No Recirc.	253- 429	86.9	92.7
4	Deep—Recirc.	245-1170	85.7	90.8
8	Two Stage	192- 930*	66.5*	90.2
4	Shallow—Recirc.	705-2080	81.7	88.1
4	Deep—Recirc.	1190-1950	78.7	87.5
3	Deep—No Recirc.	720-2130	75.7	82.8
3	Deep—Recirc.	2520-5750	70.3	78.3
4	Shallow—Recirc.	2370-8250	70.1	74.8

*First stage.

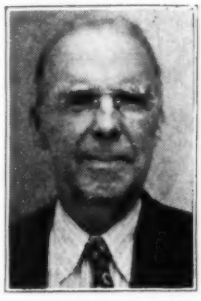
In single stage deep filters without recirculation, the effluent ran from 14 to 49 ppm. when the loading was below 300 lbs. per acre ft. per day. Above that loading the effluent was poor and the B.O.D. removal dropped below 90 per cent. Single stage deep filters with recirculation showed B.O.D. removals greater than 90 per cent when the loading was below 2,000 lbs. per acre per ft. per day, but higher loading produced poorer results.

In shallow filters with recirculation rates of 50 to 1,050 per cent, the loading varied considerably, but at the higher loadings the results were poorer. In two stage filters 85 to 90 per cent overall reductions were obtained and this reduction was fairly constant. High rate filters produced intermediate results between primary and complete treatment with either standard filters or activated sludge.

From observations on the character and composition of the sewage, Dr. Mohlman showed that the presence of ammonia helped the high rate filters and while high rate filters do not give the polish of low rate filters, they are good enough in many cases. An important factor, believes Dr. Mohlman, is the momentary rate of application and he thinks that the acre foot loading unit is a feasible basis of comparison while the acre surface unit is not.

This paper was discussed by **W. A. Hardenbergh,** who as Colonel in charge of the U. S. Army Sanitary Corps, had observed the operation of more than 100 plants in the army. Mr. Hardenbergh said that on aerofilters the limits of application seemed to be 2 lb. of B.O.D. per cu. yd., or 3,000 lb. per acre ft. per day. Critical loadings were reached when the load became 4½ lb. per cu. yd. Recirculation is necessary above these limits and if the concentration of the sewage applied is greater than 135 ppm. of B.O.D., dilution is needed.

Commenting on "What Makes a Trickling Filter Click", Mr. Hardenbergh mentioned that adequate ventilation and drainage are essential, that suspended matter should be kept out of the applied liquor, and that the size of the stone should be between 2½ to 4 inches with the larger size being preferable.



Toastmaster
H. E. Moses
Chief Engr.
State Dept. Health
Harrisburg, Pa.

Magician
Lloyd B. Nelson
Eastern Sales Mgr.
U. S. Pipe & Fdy.
Philadelphia

Mr. Hardenbergh expects the high rate filter to become used more in the future with high rate filters being used for roughing to be followed by standard rate filters for polishing. According to the speaker, we have a sound basis for design but we don't know yet why some work better than others. Perhaps, says Mr. Hardenbergh, it is the "treatability of the sewage." F. H. Waring of Ohio has observed this factor, pointing out that in the B.O.D. curve of certain sewages the K value is 0.1 in which the 5-day B.O.D. is 68 per cent of the 20-day B.O.D., while on others the K value is 0.18 where the 5-day B.O.D. is 84 per cent of the 20-day B.O.D. Perhaps, says Mr. Hardenbergh, this is the reason for the variation in the operation of high rate filters.

On this subject Dr. H. Heukelekian, Associate Professor at Rutgers University, remarked that temperature is important.

Chlorination of Sewage

N. S. Chamberlin, Sanitary Chemist of Wallace & Tiernan Co., Newark, gave a review of chlorination practices in sewage treatment. In 1946 there were 1,320 sewage plants using chlorine. Of these, 139 are in Pennsylvania, constituting 46.5 per cent of Pennsylvania's 297 sewage plants.

The use of chlorination in sewage treatment has grown rapidly since it was first used in 1892 in Hamburg, Germany, and first used in this country about 1912 by Phelps in Boston. Mr. Chamberlin stated that chlorine is considered useful in sewage treatment in four different ways. It may be used for disinfection, as an adjunct to primary treatment, as an adjunct to secondary treatment, and as an adjunct to sludge disposal.

For disinfection purposes it is generally considered that at least 0.5 ppm. residual of chlorine should

"Bill" Snelsire
Penna. Salt Co.
Pittsburgh, Pa.
E. F. Twomey
and
Myron G. Mansfield
Morris Knowles Engrs.
Pittsburgh, Pa.

A. Metzger
Supt. Treatment Works
Allentown, Pa.
Dow I. Sears
Boro Manager
and
Eugene Swineheart
Supt. Treatment Works
Pottstown, Pa.

J. E. Tarman
Division Director
and
Max U. Priester
Asst. Director
W. H. & L. D. Betz
Chemical Engineers
Philadelphia

Frank Roe
Eastern Manager
J. J. Miller
Sales Engineer
R. Huessener
Sales Engineer
Chicago Pump Co.

G. R. Taylor
President
E. E. Dellette
Secretary
Board of Health
Youngwood, Pa.

be maintained at the end of a 15 minute contact period. The amounts of chlorine required vary considerably for raw, settled, and treated sewage. Mr. Chamberlin noted that studies at a Pennsylvania sewage plant had indicated that the chlorine demand per capita was approximately 0.006 lb. per day, which compared very well with the figure of 0.005 lb. per day as found by Symons and associates at the Buffalo, N. Y., plant a number of years ago.

When chlorine is used as an adjunct to primary treatment, it may be of benefit in odor control and the prevention of sewer deterioration, in which case it is best to add the chlorine up-sewer. From 20 to 25 per cent of the chlorine demand satisfaction will hold down odors. Chlorine is also helpful in preventing plant overload, in assisting with grease removal, in increasing the clarification both in plain settling and chemical precipitation, and by decreasing the load on the stream.

As an adjunct to secondary treatment, chlorine has been found helpful on trickling filters for odor control, prevention of filter pooling, prevention of fly infestation, and general filter improvement. In activated sludge plants bulking has been kept down by chlorination and diffuser plates have been cleaned by chlorine.

As an adjunct to sludge disposal, chlorine has been used to control foaming, to improve the supernatant liquor and waste activated sludge, and to thicken waste activated sludge. The control of bulking by return sludge chlorination has been adequately presented and described in articles by Tapleshay and Adams in the Reference & Data Issue of *Water & Sewage Works* of July, 1947.

The subject of sewage chlorination and its effectiveness was discussed by **Gordon J. Wiest**, Chemist of Albright & Friel, Engrs., Philadelphia, Pa. Mr. Wiest pointed out that disinfection control needs bacteriological tests which take too much time and work. He raised the question as to whether or not sufficient bacteriological control could be obtained with the ortho-tolidin residual test. Mr. Wiest believes in the use of chlorine as a preventative measure and not as a cure in treatment plant operation, and he commented on Mr. Tapleshay's work to the effect that he had found prechlorination as effective in the control of sludge bulking as was the two-minute contact with 5 ppm. of chlorine recommended by Tapleshay.

The subject of safety in handling chlorine for sewage chlorination was discussed by **Mr. Warren** of the Pennsylvania Salt Manufacturing Co., in the absence of George Benbury, packaging and safety engineer. Mr. Warren commented on the use of safety precautions at sewage treatment plants and gave a thorough dissertation on the handling of chlorine equipment. These rules for the safe handling of chlorine may be found in the Chlorine Institute Manual on Chlorine Handling. This Manual has been reprinted almost in its entirety in the July, 1947, issue of *Water & Sewage Works* under the title "Chlorine Handling."

Maintenance of Electrical Equipment

By means of slide-sound films and sound motion pictures, **J. J. Monroe,** Maintenance Supervisor, Middle Atlantic District, Westinghouse Corp., and **H. W. Yerkes,** Industrial Div. of Westinghouse Corp., Philadelphia, presented the Elements of Electricity and Maintenance of Electrical Equipment. Mr. Yerkes said that the responsibility of the electrical manufacturer to the sewage disposal field was to help it do a better job. He pointed to the countrywide service of Westinghouse as well as its new equipment and its individual pick-up service for equipment repairs.

Programmers

N. S. Chamberlin
Sanitary Chemist
Wallace & Tiernan
Newark, N. J.

Gordon J. Wiest
Chief Chemist
Albright & Friel
Philadelphia

As to the causes of motor failures, 90 per cent can be attributed to these four items: Dirt, moisture, friction, and vibration.

Mr. Monroe stated that maintenance can be divided into two classes, preventive maintenance and compulsory maintenance. In preventive maintenance it is important to select the proper equipment with adequate rating, to have competent inspectors and inspections, and to have card records of the maintenance. A schedule of inspection should be set up.

On the subject of electrical control devices and their maintenance, Mr. Monroe gave the following 10 checks: One, make sure all connections are tight; (2) make sure all operating parts stay clean; (3) make sure that control device stays dry; (4) look for the presence of copper oxide; (5) inspect contacts for excessive roughness; (6) test for normal clearances and free working of moving parts; (7) test for firmness of contact pressure; (8) inspect for frayed shunts; (9) inspect thermal relays for ambient temperatures surrounding their enclosures; and (10) make sure each control device is operating at rated voltage.

OPERATORS' FORUM

Under leadership of **Robert M. Bolenius,** Chief Chemist, Lancaster Sewage Treatment Plants, an "Operators' Forum" was conducted. The panel of discussors included Norman G. Young, Borough Manager, Phoenixville, Pa.; T. R. Haseltine, Chester Engineers, Pittsburgh, Pa. (a former plant operator); George Boone, Supt. of Treatment Works, Norristown, Pa., and Paul Longley, Supt. of Treatment Works, Radnor-Haverford Township, Upper Darby, Pa.

On the topic **Plant Management and Public Relations, Norman G. Young** pointed out the value of keeping the plant clean, neat and attractive, suggesting the motto, "Spruce-up; Paint-up!" He pointed to the duty of every plant manager to himself and the profession as being that of selling himself to the city authorities, especially the Council, and thereafter go after what's needed at the plant and most likely it would be approved by the powers that be. The successful plant manager finds no time to gripe about what he needs and can't get through the Council. The practice of griping to the public at large is inexcusable and with certainty will react very unfavorably on the griper. The most capable plant operator is the fellow who makes the most of what he has to do with, and from which great satisfaction derives when operating results exceed expectations.

T. R. Haseltine stressed the point that operators should develop a schedule or program covering operation and maintenance and stick to the program—come Hell or high-water. Too many operators do

those things well that they like best to do and are apt to neglect other matters. This type of disorganized maintenance and operation constitutes bad practice and a poor example for plant employees.

"Steve" Rankin, of the Dorr Co., commented on the fact that a plant which is kept up in good appearance was usually the best operated plant also. To the city officials and the general public "Good Housekeeping" constituted the most impressive part of plant operation and was the most effective method of securing appreciation and cooperation.

L. D. Matter, of the State Dept. of Health, told operators that they should never consider their position as being lowly. The profession is honorable and deserves the respect of the community. With a little effort the public will become interested in sewage treatment, especially the youngsters who will later become voters.

L.L. Langford, Pacific Flush Tank Co., said that the successful operator would work the plant to secure every ounce of efficiency from it that design permits.

Proper Procedures in Emptying Digesters Preparatory to Inspection, Repairs, Etc., proved to be a topic with which the members of the Panel had had little experience.

Gordon Wiest, of Albright & Friel Engrs., cited an instance wherein the gas was expelled by pumping sewage or water into the digester before making any attempt to empty the digester. In another instance the floating cover on a small digester was lifted off with a crane.

R. W. Simpson, of Gilbert Associates, told of the use of a Jaeger Ditch Pump and hose jetting for removing hard packed sand and silt from a digester.

Procedure in Starting-up a New Plant was the last topic and time for one discussor's remarks only remained. Picked for the job by the Chairman, **T. R. Haseltine** said that one of the most important procedures was that of getting the brick-bats, stones, pieces of lumber, boots, etc., out of the pipes, tanks. The second was to select a good grease and oil for general lubrication use and avoid having too many types or grades of lubricants. Have the plant surveyed by a reliable lubricant firm and adopt his recommendations with the basic consideration of simplification in lubrication schedules and number of lubricants.

As to digesters he said that total alkalinity rather than pH values was the thing to watch. If the total alkalinity drops below 2,000 ppm., it is time to add lime *gradually* with the objective of preventing alkalinity drop below 1,800 ppm. In adding lime to digesters a little added early is worth many times the amount added after a drop in alkalinity much below the 1,800 ppm. desirable minimum.

Programmers

W. B. Hart
Director
Stream Pollution
Atlantic Ref. Co.
Philadelphia

Roy F. Weston
San. Engineer
Atlantic Ref. Co.
Philadelphia

O.R.P. in Sewage Treatment Control

Without question the most interesting and what bids fair to prove the most important element in sewage treatment process and plant efficiency control in the future, were the disclosures made by **John W. Hood,** Supt. of Sewage Treatment, Ridgewood, N. J., and **G. A. Rohlich,** until recently Associate Professor of Sanitary Engineering at Penn. State College and now connected with the Univ. of Wisconsin in the same capacity. Mr. Rohlich made the trip back especially to add theoretical discussion to Mr. Hood's practical observations of the use of Oxidation-Reduction Potential (O. R. P.) measurements in evaluating of plant operation efficiency and healthfulness of the particular process from the highly oxidative activated sludge to the highly reductive digestion process.

It was explained that the measurement of oxidation or reduction potential, as the case may be, is not too difficult for adoption in routine plant control and is not far different from measuring pH by the electrode method. O. R. P. is determined with a platinum electrode and a galvanometer which reveals millivolts on the positive (+) side of the scale indicative of the oxidative phase or on the negative (—) side of the scale indicating the reductive phase. For example, as sewage becomes stale, the positive (+) reading drops to zero and then swings to the negative (—) side as septic action progresses. The same thing happens in mixed liquor in the activated sludge process only the change from positive (oxidative) readings to negative (reductive) readings are much more rapid. Thus, a notch of O. R. P. readings taken of aeration tank samples gives the operator notice well in advance when the oxygen balance is on the down grade and troubles are impending unless more air is supplied or the load is reduced.

It was pointed out that O. R. P. readings are more quickly and simply made than the determination of dissolved oxygen. More important is the fact that the presence of dissolved oxygen in mixed liquor may be misleading, since even with 1 ppm. of D.O. the O. R. P. reading may indicate a too delicate balance and actually a negative reading. Such

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Pa. Dept. of Health
Meaaerille, Pa.

John F. Laboon
Chief Engineer
Allegheny County
Sanitary Authority
Pittsburgh, Pa.

Engineers of
Gilbert Associates Engrs.
Reading, Pa.

R. W. Simpson
Dept. Head

W. E. Yoder

K. Thompson

J. R. Simpson

H. E. Orford, Engr.

H. Heukelekian
Professor

R. P. Logan
Asst. Research
Specialist

Rutgers University
New Brunswick, N. J.

a condition is indicative of the gradual down-hill trend of the oxygen balance, at which time a slight flush of extra loading or any poisoning substance reaching the plant, such as septic sewage or chemicals, will quickly throw the process into a tail-spin from which recovery is painful. In other words, measurement of the O. R. P. value of sewages and mixed liquor is equivalent to putting a telescope on the dissolved oxygen test which would penetrate the realm of things to come rather than stop at revealing conditions of the moment.

By the same token O. R. P. readings on digester liquor reveal the trend from the desirable anaerobic (negative) readings toward the positive zone. The most effective and readily applied corrective of loss in negative potential of digester contents had been found to be sludge concentration prior to transfer to digesters. The same consideration applies in the holding of the desirable high alkalinity of digester contents —i.e., the less the sewage water or liquid portion of activated sludge entering digesters the better their performance from several angles. Mr. Hood emphasized that optimum sludge condition in digestion is indicated by O.R.P. readings on the supernatant of between 100 and 200 negative millivolts. Prof. Rohlich pointed out that O.R.P. readings dropped 24 mv. for a decrease in pH of but 1.0, indicative of the greater sensitiveness of O.R.P. in operation control.

Mr. Hood demonstrated the O.R.P. apparatus which had been used in plant studies at several points and then exhibited the charts which had been developed from O.R.P. readings taken throughout these plants and explained their significance at a glance. These studies, among other things, had indicated why mild chlorination of return sludge is frequently helpful in activated sludge treatment where the O.R.P. readings indicated insufficient positive readings otherwise. Also O.R.P. readings detect septic "pockets" in treatment plants or sewers and indicate approaching odor troubles, sludge bulking, and the like; also O.R.P. reveals why partial prechlorination has served as an odor corrective measure. The use of the O.R.P. measurement as a yard-stick in plant control throws new light on the meaning of oxidation in sewage treatment, which may be provided through nature in the form of aeration or chemically through oxidizing chemicals, among which chlorine is the best known and the least expensive.

Mr. Hood revealed that through a well operated plant with secondary treatment the O.R.P. value of the final effluent should be above 400+ mv. with the increasing positive readings taking place from plant inlet to outlet. A plant receiving septic sewage with minus values has two strikes against it to begin with, but minus values can be handled and built up to +400 and higher provided the plant capacity is sufficient to take on the job of undoing the harm of septicity and thereafter going forward with the positive O.R.P. build up. Revealing bad conditions in a clarifier, the O.R.P. test disclosed a drop to —89 mv. in passage through the unit because of inefficient sludge transfer. The test also reveals dirty stretches of sewer and pump pits where solids are stranding, and reveals the need for better cleaning programs, use of copper-sulphate or chlorine to suppress septic action and odor production.

Professor Rohlich, who had collaborated with Mr. Hood in his application of the O.R.P. test in plant operation, explained oxidation as the loss of electrons; reduction as the gain of electrons. The destruction of hydrogen sulphide with chlorine and the oxidation of manganese or iron with chlorine were cited as examples of oxidation just as much as the oxidation of proteins to nitrates in the biological processes. Prof. Rohlich then revealed how rapidly dissolved oxygen drops to near zero in the activated sludge process when the air is cut off —6 ppm., dropping to 1 ppm. in 15 minutes, but more important, the revelation that after 15 minutes the O.R.P. value slides off rapidly even before the dissolved oxygen completely disappears. Other remarks by Prof. Rohlich have been incorporated with those of Mr. Hood above in our attempt to tie in the plant scale observations with the research type of laboratory studies of Prof. Rohlich.

L. L. Langford, of Pacific Flush Tank Co., drew attention to the rapidity and simplicity of O.R.P. tests as compared to the 5 day B.O.D. test or even the D.O. test as the yard-sticks in plant operation control. Touching on the relationship between O.R.P. values and pH readings, he revealed an O.R.P. drop from +351 to —101 took place in slaughterhouse waste while pH dropped only from 6.8 to 6.5.

C. L. Siebert
Cons. Engineer
Camp Hill, Pa.

R. E. Stiemke
Prof. San. Eng.
Pa. State College
State College, Pa.

Harry W. Gehm
Tech. Director
National Council
Stream Imp'rmn't

Myron G. Mansfield
Cons. Engr.
Morris Knowles, Inc.
Pittsburgh, Pa.

Fred J. Durner
F. J. Durner, Inc.
Mfr's Agent
Pittsburgh, Pa.

Wayne A. Kivell
Sales Engr.
The Dorr Co.
New York

INDUSTRIAL WASTE SYMPOSIUM

Under the leadership of **Roy F. Weston,** Sanitary Engineer of Atlantic Refining Co., Philadelphia, Pa., a large portion of the registration listened to and took part in an industrial waste symposium.

Mr. Weston reviewed the use of water and the various considerations that need be given to pollution of streams. These five considerations are hygienic, economic loss, aesthetic, legal, and public relations.

Mr. Weston is well aware of the hygienic considerations and how they have generally governed stream pollution in the past, but he pointed to the economic loss brought about by polluted water, including the loss in value of wild life, the resort business, land value, etc., all of which amount to big business. Mr. Weston is of the opinion that in the future with such a strong block of fishermen, hunters, and conservationists putting pressure on politicians, the

standards of cleanliness of streams are more likely to be those for aquatic life rather than those for public health. These standards, Mr.

Programmers

T. R. Haseltine
The Chester Engrs.
Pittsburgh, Pa.

C. Boone
Supt. of Tr'tmn't
Norristown, Pa.

Weston states, are more stringent than are public health standards. As a representative of the waste treatment personnel working in industry, Mr. Weston emphasized his belief in the need for an industrial waste division in the Federation of Sewage Works Associations.

Pennsylvania Water Resources

"Pennsylvania's Water Resources and Water Uses" was presented by **Dr. Jack Graham,** Associate Geologist of the U. S. Geological Survey. Dr. Graham stated that water is a transient commodity passing as it does through the hydrologic cycle from evaporation to cloud to precipitation to runoff and percolation. Waters in Pennsylvania result entirely from precipitation. Pennsylvania is well favored, receiving an average of 42 in. of rainfall a year, which is 13 in. higher than the U. S. average. Furthermore, precipitation is well distributed geographically throughout the state of Pennsylvania.

Approximately 50 per cent of the water that falls in Pennsylvania leaves the state by stream flow, and the other 50 per cent leaves it by transpiration or evaporation. While there are 45,000 sq. miles of surface in Pennsylvania which drains out of the state, there are only some 18,000 sq. mi. of area outside the state draining into the state.

The Susquehanna River is the largest stream entering the Atlantic Ocean. It is one of several throughout the state and Dr. Graham stated that surface water is accessible to nearly all communities in the state. About one-third of the runoff goes through the ground water stage. Forty per cent of the flow in the Susquehanna River is ground water. Water movement underground depends, according to Dr. Graham, on rocks, fractures, and other geological factors.

Of some 1,500,000,000 gallons of water per day used in Pennsylvania, 90 per cent comes from surface supplies. The smaller cities use the groundwater.

The industrial use of water in Pennsylvania is far greater than the domestic use. There are some 225,000,000 gallons of groundwater daily used for cooling purposes because of its preferential properties and characteristics.

Dr. Graham also spoke on the pollution of surface supplies and underground waters. Industrial wastes discharged into the underground greatly affect the composition of groundwater. Municipal sewage, mining wastes, and industrial wastes are important in relation to the pollution of streams in Pennsylvania. At the present time not many cities in Pennsylvania have sewage treatment and as a result both the Susquehanna River and the Ohio River are strongly polluted. Culm in rivers is particularly bad in Pennsylvania, and the mineralizing of waters of the state by coal mining is bad, particularly from strip mining, where pollution begins from 12 to 18 months after the stripping starts, but continues for more than 20 years after the stripping is stopped.

Although the state water board has a clean streams program by which it is requiring both industry and municipalities to clean up their waste discharge, the work of the U. S. Geological Survey has been purely fact finding. It has produced no regulatory measures. This work is continuing.

Industrial Stream Pollution Effect on Aquatic Life

"The Influence of Industrial Stream Pollution on Aquatic Life" was ably presented by **W. B. Hart,** Supt. of the Gas, Acid and Drainage Dept. in charge of pollution abatement activities of The Atlantic Refining Co. Dr. Hart, who has authored a book on the effect of toxic substances on fish, is well qualified to speak on the subject, and he pointed out the reason for the interest in the effects of waste on aquatic life. Wastes definitely affect the physical and chemical characteristics of a water, making it unclean, and these natural characteristics being affected, they in turn affect aquatic life in the streams. Such items as acidity, alkalinity, pH, dissolved solids, dissolved oxygen, turbidity, color, settleable solids, temperature, toxicity, etc., are important to aquatic life. From a broader point of view the condition of the stream is determined by what lives in it. If nothing lives in it, it is truly badly polluted.

Dr. Hart emphasized that the character of the water is determined by the typography, cover of the ground, stream gradient, etc., and that anything which displaced this would affect the aquatic life therein. Therefore, the aquatic life is an indicator of the condition of that water. Acids or salts which depress the pH of the water cause a corrosive action on the tissues of three levels of life, bacteria, invertebrates, and fish. Gelatinous protective coating is coagulated particularly on the breathing apparatus of fish which prevents transfer of gas (oxygen), and the fish die of asphyxiation.

Dissolved solids are important to life in streams because they affect the osmotic movement of water through the tissues. As the solution of salt in the water gets stronger, the water moves out of the animal cells and the fish or other animals literally dries up.

Dissolved oxygen is obviously very important to fish and other aquatic substances which it utilizes, and turbidity is important because it affects photosynthesis which may prevent the production of oxygen in the water. Temperature likewise is very important to fish particularly. Settleable solids affect bottom growths, which in turn affect the whole aquatic life cycle oftentimes. Toxicity is often a matter of concentration or quantity, but it is highly important.

Dr. Hart concluded with the statement that the form of life in streams is the best indication of how pollution is proceeding or how pollution abatement affects that stream.

Pennsylvania's Approach to Stream Pollution

The "Administrative Policies and Problems as Applied to Industrial Waste Disposal in Pennsylvania" was discussed by **J. R. Hoffert,**

Programmers

L. L. Langford
Eastern Sales Mgr.
Pac. Flush Tank Co.
New York

J. R. Hoffert
Asst. Chief Engr.
State Dept. Health
Harrisburg, Pa.

Asst. Chief Engr. of the Penna. Dept. of Health. Mr. Hoffert reviewed the anti-pollution acts in Pennsylvania, including the Act of 1945, which also included the removal of silt in the streams as pollutant. Mr. Hoffert said that the State Sanitary Water Board had classified streams of the state, picking all streams as requiring primary treatment except those with strong acid mine wastes, and picking streams which are now clean or were used for water supply as requiring complete treatment for sewage discharged thereinto.

The Board says that industry should not ask the stream to do the work which the industrial waste treatment itself should do. Discrimination between municipalities and industries is not made in Pennsylvania; both are treated the same before the Board, which wants to proceed in a logical manner on a drainage basin area.

A question in point still under discussion is what is equivalent reduction and what constitutes a reasonable starting point in the matter of reducing the strength of waste. Mr. Hoffert believes that the strength of waste as discharged from a treatment plant should be that to be expected from good housekeeping, and thereafter such reduction of wastes as may be obtained should be obtained. This has been tried on an industrywide basis from a milk industry where the cooperative approach was used and good success was obtained.

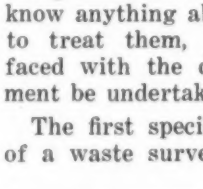
Mr. Hoffert stated that industry must find a way to treat its waste if none is now known, and that industry may not always expect that by-product recovery is the answer. It must accept the charge of waste treatment as a legitimate part of production costs. This latter tenet raises the question of unfair costs between one state and another, but Mr. Hoffert states that if the states do not act, federal legislation is bound to come and ensure action so that there will then be no differential between the cost of production in one state as against another because of differences in requirements for waste treatment.

Mr. Hoffert concluded with the thought that the State Sanitary Water Board puts litigation last as a means of producing stream pollution abatement. However, Mr. Hoffert says industry should think about what its waste is, must operate its plant properly, accept its responsibility, and proceed to work out its problems cooperatively. They must be worked out, however, and it must be realized that plans alone do not bring abatement. While plans are necessary now, actual construction must be undertaken and cannot wait until prices come down.

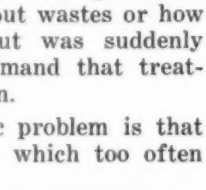
Industry Views Waste Treatment Problem

W. B. Hart, who spoke on the influence of industrial stream pollution on aquatic life, also presented the viewpoint of industry on the waste treatment problem. Dr. Hart says that many of these problems have been precipitated by the sudden demand for their solution. The problems have been around for a long time, but no one had ever done anything about them. Industry did not know anything about wastes or how to treat them, but was suddenly faced with the demand that treatment be undertaken.

The first specific problem is that of a waste survey which too often has been too superficial because both the industry and their consultants had not had much experience in the matter of industrial wastes surveys. Furthermore, industry could not understand what waste surveys meant, nor could they understand what purity was required of the waste.



Ph. D.
Jack Graham
Assoc. Geologist
U. S. G. S.
Philadelphia
(Programmer)



"M. S."*
Paul Rogers
Chemist
State Dept. Health
Harrisburg
**Master of Softball*

Dr. Hart divided industries in Pennsylvania into three groups—those which offered complete cooperation with the state program; those who expected the program to fall down; and those who cried "persecution" and predicted failure for the program and refused to do anything. After the last legislature, the first two groups became merged and the third group became less vociferous as well as smaller. Now more thought is being given to what to do and how much it will cost Pennsylvania. The program of stream pollution abatement in Pennsylvania is bi-partisan and there has been no political pressure. Dr. Hart admits that people have a right to recreation, will want it, and will ask for it, and therefore there will be no demise of the program.

As to opinions of industry regarding the program, some think that the state should develop treatment but that taxes for that development would be levied on both those for whom the treatment would benefit and for those for whom it would not. This would not be a fair expense.

Industry would much rather do its own job if the state would just tell them how much reduction of pollution is desired. Industry does not like the use of the words industrial equivalent. It hopes that terms, standards, etc., can be agreed upon.

Waste treatment is an essential tool to the correction of the condition of polluted streams. Therefore, says Dr. Hart, one must look to the stream and its aquatic inhabitants to see what had been done. The biological and chemical condition of the stream will be evident by the aquatic life therein and when the goal has been reached there is no need to go farther.

Dr. Hart concluded with the statement that he believes in the program, which is a big program, and that he believes that Pennsylvania, which is being watched from all over the country, would show the way.

The presentation by Dr. Hart was discussed by **F. B. Milligan,** Industrial Wastes Engineer of the Penna. Dept. of Health, Harrisburg, Pa. Mr. Milligan commented particularly on that section of industry which is delaying the progress of the program. These people object to the theory that the receiving stream should be standard, or that standards should be set up for the receiving stream. They raise such objections as: where shall the sample be taken, when, and what stage of the stream, etc. Mr. Milligan takes a view somewhere between the arbitrary per cent reduction and the condition of the stream. The Sanitary Water Board has picked and categoried the streams and then set minimum reductions desirable, and has specified added treatment if necessary. Although industry has a right to ask for definite standards, Mr. Milligan points out that if those are replaced by a new basis of determination which is suggested by Dr. Hart, then it will delay progress.

In spite of some rather fundamental disagreements of approach to the problem, it is obvious that both industry and the Pennsylvania State Dept. of Health are working towards a joint solution of the problem of stream pollution in the state of Pennsylvania.

DIESEL AND GAS ENGINE EQUIPMENT

by
A. M. BOEHM
Worthington Pump and Machinery Corp.
HARRISON, N. J.

ONLY a few years ago, anyone writing of Diesel Engines felt the subject to be so unfamiliar that he was compelled to begin any article on this subject with detailed answers to these pre-conceived questions: "What is the *Diesel Engine?*" and "What makes it *go* without spark plugs and ignition devices?"

Today, such an approach to this subject is unnecessary. The Diesel engine still reigns supreme as the world's champion of the Thermal Efficiency League after over 50 years of competition.

Probably no application represents a better spot for a Diesel than in the field of pumping water. In water works applications, we have for the most part a steady continuous load day in and day out. An engine intelligently selected for the load has an opportunity to work at the most favorable point of its fuel consumption curve. Should the capacity be required to be varied, it may be done by varying the speed just as easily as in your car. The permissible speed range for stationary engines is usually from 50 to 100 per cent of rated speed; this can be extended for the lower limit by special attention to governing, fuel injection equipment, and torsional vibration analysis. Unlike a motor driven centrifugal pump unit where the speed is constant, a Diesel driven pump has many capacities and is, therefore, a very flexible unit.

The Author

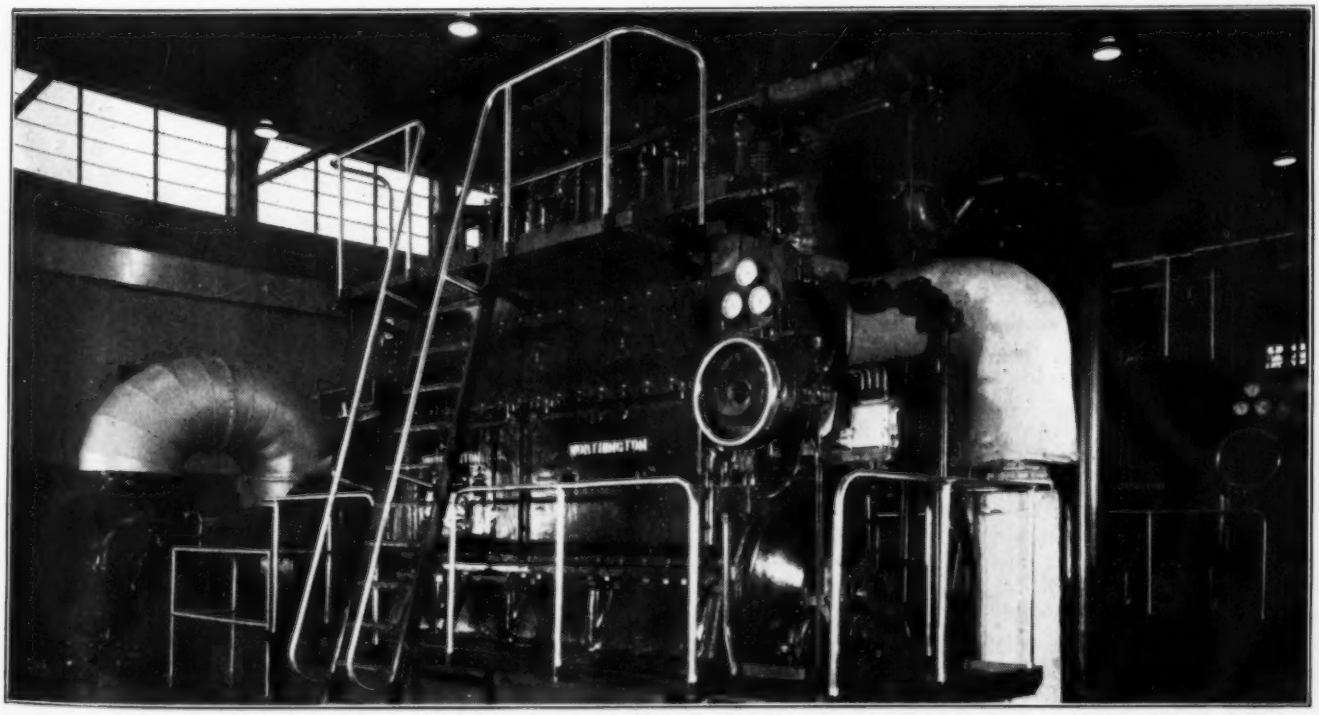
Selecting Diesels for Water Works

In selecting Diesel engines for waterworks, or, in fact, any application where the service is heavy and continuous, the following points may be of value as a guide:

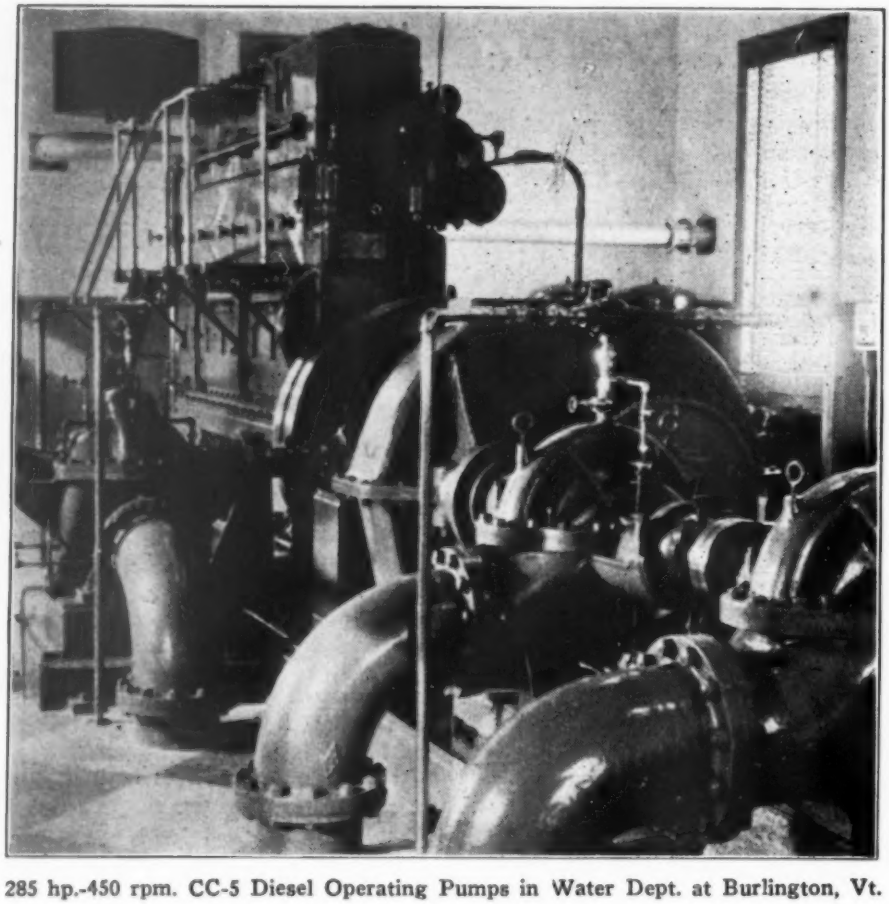
1. Select an engine with a comfortable margin in rating over the peak hp. to be carried. If the engine is to drive a pump directly, this factor may be easily anticipated. If the engine is to drive a generator from which electric energy is to be used for a number of motor driven pumps, then careful analysis should be made to make sure that the engine generator has ample rating to cover the maximum number and starting characteristics of motors to be handled.

2. Present-day limits for heavy duty stationary engines call for continuous ratings to be based on 80 lb. BMEP for non-supercharged four cycle engines, and 120 lb. BMEP for supercharged four cycle engines. For two cycle engines of the pump scavenger type, 65 lb. is a generally accepted figure.

3. Since there is such a wide variation in available Diesel designs, it is difficult to state speed limitations in terms of rpm. An alternate and fairer system is to express allowable speeds in terms of the average piston speed in feet per minute. This system makes allowance for the fact that shorter stroke engines may operate at a higher rpm. and still have no higher piston speed than large stroke slower rpm. engines. For stationary engines, the present-day practice is to allow about 1400 ft. per min. piston speed for four cycle engines, and 1000 ft. per min. for two cycle.



500 hp. Dual-Fuel Engine at Tallman's Island Sewage Plant, New York City



285 hp.-450 rpm. CC-5 Diesel Operating Pumps in Water Dept. at Burlington, Vt.

4. Cooling systems should always be of the indirect type; that is, a double circuit system in which one circuit consists of the engine cooling water which is circulated constantly. Somewhere in its passage, after cooling the engine jackets and lubricating oil, it gives up enough of its heat to cool it from 15 to 20° F. through some heat exchange apparatus furnished with raw water. This latter may be a shell and tube heat exchanger, an evaporative cooler, a radiator, or a cooling tower with tubes in the base.

For waterworks jobs, probably a heat exchanger of the shell and tube type lends itself better than any of the other methods, as a supply of raw cooling water may be taken from the discharge of the waterworks pumps and, after passing through the heat exchanger, can be returned to the pump suction line. Good practice is to supply a thermostatically operated valve in a bypass line around the engine water circuit through the heat exchanger, so that the discharge temperature of the cooling water from the engine is held approximately constant regardless of the variation in temperature of the incoming raw cooling water.

There are a number of ways of accomplishing the same result, but the important point is not to have raw water running directly into the engine and then to waste. The bad features of this arrangement are:

a) It allows scale to build up on the liner or cylinder walls, thus putting an obstacle in the way of efficient heat dissipation.

b) Too great a temperature differential is permitted when very cold water hits the liner, inside of which instantaneous firing temperatures as high as 2000° F. may be present. Distortion, piston seizure, and cracking of cylinder and heads are the not too infrequent results of direct raw water cooling.

Turbocharged Diesels

Among the later developments in Diesel design is the application of supercharging to four cycle engines.

Supercharging in its simplest sense merely means supplying the cylinder with fresh air at a pressure higher than that of the prevailing atmosphere. In this way a greater weight of oxygen is introduced into the cylinders, thus providing more oxygen to burn more fuel.

Supercharging may take two forms:

a) A mechanically driven blower, usually of the lobe vane type. With this type, the power to drive the blower is deducted from the total hp. developed by the engine. The net gain in useful hp. is about 33 per cent of the unsupercharged rating. This is the form usually found on engines up to about 250 hp.

b) Turbocharging, in which the kinetic energy of the exhaust impulses is used to drive a vaned runner in a casing. On the same shaft with this runner is another vaned runner which is essentially a centrifugal air compressor. It takes in air at atmospheric pressure and delivers it into the engine air intake manifold at about 3½ lb. pressure gauge.

There is no mechanical connection between the turbocharger and the engine, as the sole motive power to turn the runners is obtained from the pressure waves of the cylinder exhausts. In order to utilize these waves to the fullest and to prevent the exhaust from one cylinder cancelling out the wave of another, the exhaust system is arranged so that only two cylinders exhaust into the same pipe. In a six cylinder engine we would have three separate exhaust lines from the cylinders to the inlet nozzle of the turbocharger. Usually, for comfort and safety to the operating personnel, all exhaust lines are contained in a water filled enclosure running the length of the engine.

Turbocharger—Its Function

The turbocharger air end has two duties to perform:

1. It must furnish air to the engine intake at a pressure higher than prevailing atmosphere. The purpose as stated before, is to supply more oxygen so that more fuel may be burned to gain a greater hp. output.

2. It must thoroughly scavenge the cylinder of burnt gases from the previous combustion stroke. In turbocharged engines the gain in hp. is as fully dependent on cleansing action as the increased amount of oxygen supplied by higher intake air pressure. To accomplish this function the overlap of the inlet and exhaust valves is greater than with the naturally aspirated type, thus allowing a longer time to elapse when both valves are open, and therefore insuring that the fresh incoming air has almost completely displaced the burnt gas tending to remain in the clearance space above the piston.

Benefits of Turbocharging

The benefits of turbocharging may be listed as follows:

1. It increases the useful work from 40 to 50 per cent compared to the unsupercharged rating for the same bore, stroke, number of cylinders and rpm.

2. Fuel consumption is materially reduced. The improvement in fuel consumption manifests itself particularly at partial loads, which is a distinct advantage on generating units where the load is variable and the average load factor may be considerably under the rated capacity.

So pronounced is the improvement at positive loads that our standard fuel consumption guarantees for one-half load on a turbocharged engine are lower than the full load guarantee on an unsupercharged engine.

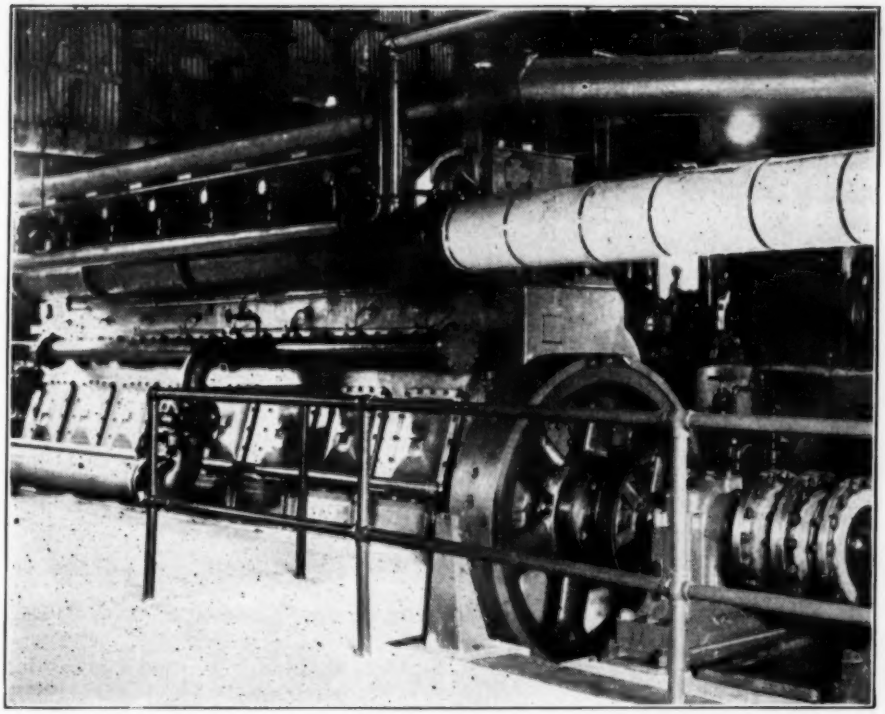
3. The turbocharger automatically adjusts the amount of air delivered at the engine intake in accordance with the load on the engine. By this is meant that if the engine load is suddenly reduced, the weight and temperature of exhaust gases are reduced and, therefore, less energy is present to impart a turning effort to the exhaust runner. The turbocharger therefore slows down and delivers less air to the engine.

4. Compared to the equivalent rating of an unsupercharged engine, the turbocharged engine has the following additional commercial advantages:

a) The first cost per hp. or per kw. is less.
b) Takes up less floor space—smaller building required.
c) Takes smaller foundation.
d) Total weight is less—smaller freight and hauling charges.

Adaptable for Future Growth

Sometimes it is known in advance that within one or two years from the time an engine-generator unit is installed, additional load may be expected to be carried. In a case like this it is often convenient to defer part of the first cost of the engine to take both present and future loads. This may be done by purchasing an engine, unsupercharged, of a size to take the present load, but installing with it at the start a generator, exciter and switch gear to take care of the later increased rating when a turbocharger is added to the engine. If this procedure is recognized, the engine builder can provide initially for some of the changes required for later turbocharging. The principal addition to be made for later turbocharging would be a new camshaft with inlet and exhaust cams arranged to give the greater valve overlap mentioned before.



DD-8 Diesel Engine, 625 hp. Driving 48-in. Centrifugal Pumps Hunter Canal Co., Crowley, La.

A prerequisite for turbocharging any engine is the use of oil cooled pistons to dissipate the greater heat release from the piston crown due to burning increased amounts of fuel. Valve area of the inlet and exhaust valves must be increased as greater quantities of both air and exhaust gases must be handled without excessive velocity which would defeat the scavenging function. Increased valve areas are usually obtained by elimination of valve cages, permitting the valves to seat directly in the heads. This also makes for better cooling of valves. Increased valve areas may also be obtained by twinning the exhaust and inlet valves, which naturally complicates the head and valve operating mechanism.

Gas and Dual Fuel Engines

An article such as this, would be incomplete if it did not pay its just respects to the spark ignition gas engine, whose history antedates that of the Diesel by many years.

In the early '30's the spark ignition low compression gas engine, which hitherto had had its chief use where natural gas was available at reasonable prices, began to find a new use in sewage disposal plants where sludge digestion gas was available. As a result, today there are some 208 engines aggregating 64,115 hp. designed or operating on sewage sludge gas. These are being used to drive generators, vertical and horizontal sewage pumps and blowers for aerating service.

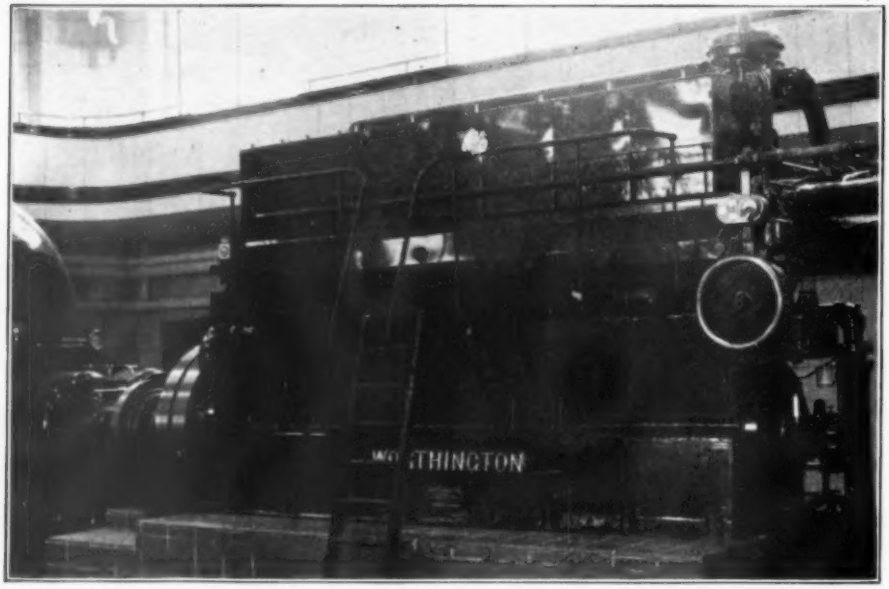
In these plants, heat recovery from both the jacket water and exhaust is almost universally used, the recovered heat being used usually to heat the water circulated through coils in the digestion tanks.

Engines of this type, equipped with either magnetos or distributors and spark plugs in the head for ignition, have a compression pressure of about 125 lb. compared with 450 to 480 lb. for those operating on the Diesel cycle. They require from 9,500 to 10,000 btu. to produce a horsepower hour compared to about 7700 btu. for the Diesel engine, or about 25 per cent more fuel input.

In sewage plant work where the gas is a by-product and is obtained almost free-of-charge, efficiency in an engine has generally been of secondary consideration until recently.

But, just as with pumps, compressors and other machinery, where there always seems to be a demand for the highest efficiency or duty, so it is with engines for sewage plant applications. There are very good reasons for this demand, and among these reasons are:

1. The gas generated in the digestion tanks is not available at a constant rate. The generation rate varies with the seasons, the amount



CCG-7 Gas Engine, 465 hp., 430 rpm. Operating on Sewage Gas at Ft. Wayne, Ind.

of dilution from storm waters and the strength of the sewage. Variations may be noted from hour to hour. Unless storage holders are used, in which excess gas may be stored against the time when a deficit in supply occurs, continuous operation of engines for full power requirements of the plant is often not possible.

2. It was also apparent that where engines were installed in a new plant, they could not be operated at the start due to the fact that gas sometimes is not available for as long as three to six months. In cases like this it has been customary to do one of three things:

a) Contract for electric service for this temporary condition. Inasmuch as sewage plants are usually located in areas remote from densely populated districts, in most cases this meant extending electric facilities at a high cost. Operating costs, consisting of demand and energy charges, were quite high compared to the later operation of engines on no-cost gas.

b) Contract for gas service with which to operate the gas engines during the initial period and later on during the gas deficit periods. Gas rates, except in localities furnished with abundant natural gas the year round, are seldom low enough to justify its use in gas engines.

c) Install a separate straight Diesel engine to operate plant equipment until such time as plant gas is available. This would represent a large capital investment with a poor use factor.

From the above, it will be seen that here was a situation crying for an engine capable of operating on either gas or oil with a quick and easy means of conversion from one fuel to another.

Previous to August, 1944, in the United States, the only conversion from gas to oil was available by changing a low compression (125 lb. per sq. in.) spark ignition gas engine to a high compression (450-475 lb. per sq. in.) Diesel oil engine by making physical changes to the engine itself. This change of compression could be done in two ways:

1. When operating as a spark ignition gas engine, a water cooled distance piece was installed between the head and liner. When operation on oil as a Diesel was called for, the heads were lifted, the distance piece removed, valve operating rods were shortened and governor connections changed. Fuel pumps were added and spray valves were installed in openings in the head that had been plugged when operating on gas. This change resulted in a gain in hp. of about 8 per cent.

2. Liners and pistons could be changed, but this usually resulted in a loss in hp. of about 15 per cent. This hp. loss from gas to Diesel was mainly due to the fact that smaller liners had to be used, since compression and maximum pressures were much higher for the Diesel engine—the latter being of the magnitude of about 360 lb. per sq. in. for gas and 600 lb. per sq. in. for Diesel.

With both conversion methods, it meant that when operating on gas the thermal efficiency was about 25 per cent lower than on oil, and substantial shutdown periods were required.

Previous to August, 1944, American engine designers had always thought that it was impossible to compress air-gas mixtures in spark ignition engines much above 125 lb. per sq. in. due to problems of pre-ignition. The mixture had the annoying habit of firing by auto-ignition on the compression stroke without waiting for the timed spark to ignite it. This resulted in loss in power and excessive peak pressures that were injurious to bearings. No difficulty from pre-ignition was encountered at orthodox spark-ignition compression pressures on gases such as natural, butane, propane, or sewage sludge, but gases such as manufactured containing appreciable percentages of free hydrogen were notorious for pre-ignition troubles, and the only antidote in most cases was derating the engine, which was the equivalent of lowering the compression pressure.

Based on research and actual commercial results which had been attained in England from 1937 to 1940, Worthington undertook the problem of perfecting an engine that would operate equally well on oil or gas, using Diesel high compression pressures and no other ignition devices except the heat of compression. In August, 1944, this was successfully accomplished with the following results:

a) Oil or gas could be used as fuel.
b) No shutdown was necessary to change from one fuel to another.
c) Load need not be removed during time of changeover.
d) Fuel consumption on gas dropped about 25 per cent below the current spark ignition gas engine consumption.

These results were very encouraging. It was found that if the air-gas ratio was made as perfect as customarily used in spark ignition engines, pre-ignition took place. But, if the mixture was made so lean that it was difficult to auto-ignite, no pre-ignition took place.

To ignite the lean charge, a small amount, 5 to 7 per cent of fuel oil was sprayed into the air-gas mixture at a predetermined point on the compression stroke. The fuel oil readily ignited itself under the heat of compression and in so doing, initiated, propagated and sustained the ignition of the air-gas charge. The small

amount of fuel oil used is called pilot oil.

This engine was first demonstrated in August of 1944, but there were yet *additional* things this engine should be able to do before it would answer all of the requirements desired in sewage plants. It should be able to operate on any proportion of oil and gas simultaneously from 100 per cent oil to 95 per cent gas and 5 per cent pilot oil, and it should be possible to select proportions to be made either manually or automatically. Furthermore, governing was desired so that the engine always operates on gas up to maximum availability of gas supply. Upon failure or depletion of gas supply, the proportion of fuel oil was to be automatically increased to make up the gas deficit.

By November, 1944, Worthington was able to demonstrate an engine doing all of these things. A little later, supercharging was applied for the first time to what has come to be known as the *"Dual Fuel Engine."* Again, supercharging has given all of the benefits on this engine which were covered before on the straight Diesel engine.

Water & Sewage Works Got Lion's Share FWA Funds

The Federal Works Administration had at the closing of the federal program of advancing funds for public works plans and specifications advanced $61,700,000, representing an estimated cost of $1,900,000,000 in public works projects. Applications for an additional $33,000,000 for plans and specifications could not be met due to cessation of the program.

Classified by projects, Water, Sewerage and Sanitation projects received the lion's share of FWA's distribution, with schools second. The first six classifications and amounts advanced are:

Water, sewerage and sanitation	$860,983,163
Schools	503,555,930
Other public buildings	189,833,144
Hospitals and public health facilities	107,743,077
Roads and streets	67,594,619

S. T. Powell Appointed to Md. Pollution Comm.

We have just noted in the *Baltimore Sun* that Sheppard T. Powell, well known to many of our readers,

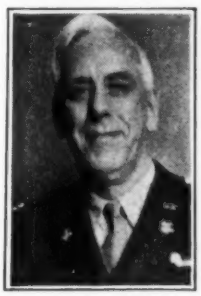
has recently been appointed by Governor Wm. Preston Lane, Jr., to the recently established Water Pollution Control Commission of Maryland.

Mr. Powell came out of R. P. I. to start his professional career as chemist at a small filtration plant in Maryland. Since entering private practice he has become internationally known as a top-flight Consulting Chemical Engineer and water conditioning specialist with offices at 330 N. Charles St., Baltimore, Md.

Col. Arthur Morrill to Return to China

Will Serve as Consultant to the U. N. World Health Organization

Col. Arthur Morrill, Supt. of Sewage Treatment at Detroit, Mich., but on leave of absence to the U. S. P. H. S. since before Pearl Harbor, is



going back to China again after but five months back in Detroit. Col. Morrill, who spent 5½ years in the Far East on active duty in the Public Health Service detailed through the Department of State, will return this time as a consultant sanitary engineer on the staff of the World Health Organization of the United Nations. As during his previous tour of duty in China, Morrill will be working with the Chinese Ministry of Health in an attempt to get water supplies and sewer systems built in Chinese cities.

As detailed in several letters from Col. Morrill published in *Water & Sewage Works*, Col. "Art" Morrill visited remote recesses of China, Ethiopia, Afghanistan and India designing sanitation systems during the war.

According to the *Detroit News*, "The State Department credits Morrill with making more friends for the United States than a legion of diplomats." Even as Morrill returned in May, both the cultural relations division of the State Department and the U. N. W. H. O. wanted to sponsor a second Morrill mission to the Far East. After five months at home, Detroit has granted another leave of absence and Morrill will leave for China on Oct. 31 via Minneapolis, Alaska, Tokyo, and Shanghai.

The extent of the job confronting Col. Morrill is indicated by the fact that China's death rate is 30 per 1000 population compared to a rate of 12 in America. Morrill thinks this death rate can be reduced by 20 per cent with the installation of water and sewage systems.

Getting pure water through a distribution system costs but a fraction of what it costs when brought in buckets by coolies from wells or a river, but the people are prejudiced against clear water, and Morrill recalls that in Chungking coolies "had to put mud in the water from a pipeline before people would accept it."

32-Page Booklet on Cycles Sent on Request

This booklet epitomizes the major results of a research on correlated cycles by Halbert P. Gillette during the last 21 years. It gives dates of the peaks or maximum of cycles and the intervals between maxima, or cycle lengths. Correlated cycles in different kinds of phenomena must have a common cause. A theory of causation is presented that applies to all correlated cycles, such as cycles in weather, in climate, in sunspots, in terrestrial magnetic forces, in terrestrial bombardment by solar electrons, in movements of the earth's crust (both minor and major), in series of geological strata, in intervals between moraines, in varves (annual deposits of sediments in lakes and seas), in tree-rings, in social upheavals recorded historically, etc.

Mr. Gillette holds a mining engineering degree from Columbia University, is a member of the American Society of Civil Engineers, is the author of many papers on Cycles, and formerly was chief editor of *Water Works and Sewerage* (now *Water & Sewage Works*), and of *Roads and Streets*.

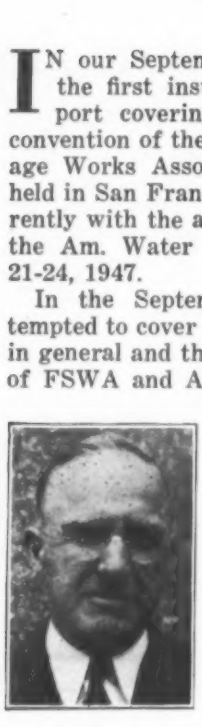
Printing of the booklet will not occur until all requests for it have been received, that is in January. Address requests to Gillette Publishing Co., 22 West Maple Street, Chicago 10, Ill.

SEWAGE WORKS FEDERATION PROCEEDINGS

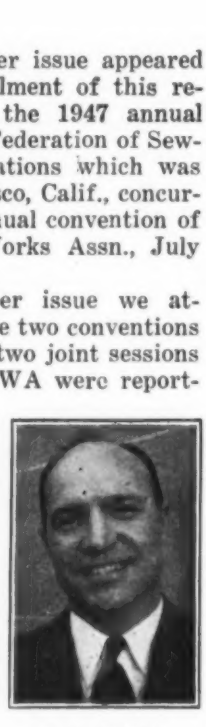
A Continuation of a Report Covering the Annual Convention of the FSWA in San Francisco

IN our September issue appeared the first installment of this report covering the 1947 annual convention of the Federation of Sewage Works Associations which was held in San Francisco, Calif., concurrently with the annual convention of the Am. Water Works Assn., July 21-24, 1947.

In the September issue we attempted to cover the two conventions in general and the two joint sessions of FSWA and AWWA were report-



President
Francis S. Friel
Philadelphia



Sec'y-Editor
W. Homer Wisely
Champaign, Ill.

ed. In this concluding installment we will complete the reporting of the highlights at the Federation's sessions.

The President's Address

The convention was opened with an address by President Francis S. Friel, Consulting Engineer of Philadelphia and well known as something of a Godfather to his Pennsylvania Sewage Works Association, which he has so well served in various ways.

In his address, President Friel reviewed the growth of the Federation, both in numbers and importance; discussed its influence upon sewerage and sanitation affairs generally; directed attention to the increasing need for a Federation interest in industrial waste problems, and cooperation with those concerned solely with the disposal of waste products from individual industrial plants. He urged that all such people be invited to join the member associations and that panels for discussion be pointed specifically at industrial waste disposal in many instances.

Mr. Friel predicted a general decline in prices of materials and a definite increase in the efficiency of labor, stating that these two factors will do much to accelerate building in general and the nationwide installation of planned sewerage facilities. The president's address was primarily aimed at stimulating still more interest of member associations and individuals in more adequate and timely sanitation facilities which have lagged during the war years and since.

Secretary Wisely Reports

In his customary thorough-going style, Homer W. Wisely, Secretary-Editor of the Federation, reported a highly satisfactory growth of the Federation and a strong financial position which had permitted the employment of a full time assistant to the Secy.-Editor in the person of Sylvan C. Martin. (Many members of the Federation will remember that not long since it was only possible from Federation funds to employ Secretary Wisely on a part time basis.—Ed.)

Mr. Wisely, commenting on the highly satisfactory growth of the Federation, reported the creation of four new Sewage Works Associations (Kentucky-Tennessee; Virginia; West Virginia; Puerto Rico) during the past eight months since the 1946 convention, now making a total of 32 member associations in the Federation. The membership growth of the Federation is reflected in an increase from 3,998 members to 4,629 for the year ending just prior to the convention—a gain of 631 members for the year. He commented on the fact that three of the four newest associations formed had included Industrial Wastes in the name of the Association, indicative of the increasing trend to consider stream cleansing in its broad aspect, including all forms of pollution and not municipal sewage alone.

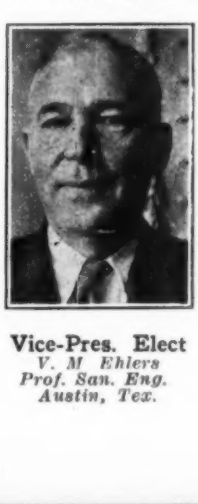
As to publications, the Secy.-Editor reported a 63 per cent gain in circulation (copies distributed) of the Federation Journal within the past five years. Within the past two years the first two of a series of planned "Manuals of Sewage Works Practice" have been issued, free copies going to all members as the beginning of a library of these helpful guides in the management, operation and maintenance of sewage works systems.

As to the financial well being of the Federation and progress made in increasing the financial strength of the organization, the books reveal that only five years ago the Federation's net worth (all assets and funds) amounted to a paltry $3,075.78, whereas at the end of 1946 its net worth had increased more than ten-fold to $35,058.15. And as of July 1, 1947, this figure had increased by better than $10,000 to a very satisfactory net worth of $45,893.93, of which less than $1,300 represents fixed assets while $44,704.47 consists of invested funds and cash.

Papers and Discussion

"Developments in Sewage Disposal for San Francisco" by Clyde C. Kennedy, Consulting Engineer, San Francisco, and Federation Director.

Mr. Kennedy, who has been closely associated with the development of sewerage facilities for San Francisco and the Bay area for many years, discussed the expansion now contemplated in existing sewerage facilities such as those at Richmond-Sunset and described plans for the new North Point Plant. The speaker stated that the two plants, upon completion, will provide treatment (plain subsidence) for sewage from 90 per cent of the area of the city. The combined capacity of both plants, upon completion, will be about 85 mgd. Mr. Kennedy's paper was replete with a detailed analysis of proposed and existing sewerage works, many of which time did not allow him to present.



Vice-Pres. Elect
V. M. Ehlers
Prof. San. Eng.
Austin, Tex.

Director-at-Large
Don. E. Bloomgren
Prof. San. Eng.
Purdue Univ.

Mr. Kennedy stressed the usefulness of filtered digested sludge cake as fertilizer in the beautiful Golden Gate Park and said that it had contributed greatly to the Park's development in recent years.

In discussing the paper, San Francisco's City Engineer, **Ralph G. Wadsworth,** commented upon Mr. Kennedy's long association with the city's sewerage problem and the impressive amount of effort and work which he had put into its solution. He then touched upon past history, directing attention to the original Grunskey plans for San Francisco's sewerage prepared in 1899 and resulting from an investigation which commenced in '93, in which Mr. Grunskey had studied four aspects of disposal, namely, dilution, chemical treatment, filtration and use on the land. Many years, he stated, had passed before anything effective had ever been done to protect the Bay waters, and Mr. Kennedy had been an important influence in all that had been undertaken.

"The Portland, Oregon, Sewerage Project" by J. C. Stevens and H. Loren Thompson of Stevens and Koon, Engrs., Portland, Ore.

After describing the pollution existing in the Willamette River, part of which is contributed by upstream users and a considerable portion of which results from the discharge of most of the sewage of Portland therein, the paper read by Mr. Thompson told of the existing combined sewerage system serving Portland and of past efforts and reports aimed at intercepting sewage now discharged into the rivers, abating the nuisance by sewage treatment and by disposal into major bodies of diluting water.

He stated that sixty-one sewers discharge into the Willamette River and Columbia Slough, in sizes ranging up to 10 feet in diameter, and then explained how the present Board of Engineers is designing an intercepting system aimed at transporting the sewage to near the city's boundaries, treating it and discharging it into the voluminous Columbia River. The problem of interception is greatly complicated by variations in the water level in the Willamette and the Columbia and elaborate precautions must be taken to prevent flooding of the interceptors and low level pumping stations.

A most unique feature in the design is a diversion from existing trunks to the interceptors. It involves the adaptation of head-absorbing vortex flow, so applied that changes in the depths of water in the trunk sewers do not greatly influence the amount of water diverted. Being of the combined type, it is obvious that the intercepting sewers will not divert large quantities of storm flow to the treatment plant, the latter being designed with a maximum capacity of 150 mgd., and, therefore, diversions from existing trunks must be carefully controlled to prevent flooding.

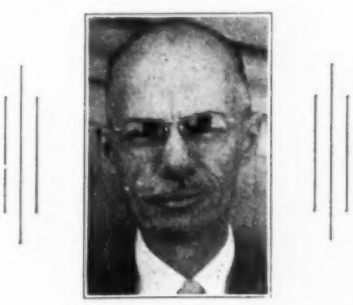
Treatment will comprise primary subsidence and grease skimming, separate sludge digestion with final disposal of the noninfectious, well-digested sludge residue, along with the primary effluent into the Columbia River, which latter has now a regulated minimum flow of 75,000 cfs. through the Bonneville Power Station above Portland.

Programmers

Clyde C. Kennedy
Cons. Engineer
San Francisco
(Federation Dir.)

A. M. Rawn
Engr.-Mgr.
Sanitation Distrs.
Los Angeles Co.

Discussing Mr. Thompson's paper, **A. M. Rawn,** Chief Engineer and General Manager of the Los Angeles County Sanitation Districts, summarized the factors which had the most pronounced influence upon the design of the Portland Sewerage Project and then referred to the solution of the problem which was being presented by the Portland Board, indicating the manner in which each of the factors had had its effect upon the system designed. Mr. Rawn, who has been serving as consultant on the project, concluded with a brief discussion of the effect of the addition of well-digested sewage sludge to primary effluent and its discharge into the Columbia, stating as his conclusion that no known means of laboratory analysis would enable one to detect the presence or absence thereof when the mixed primary effluent and digested sludge was discharged into the river with its assured minimum flow of 75,000 cfs.



California President
Geo. A. Parkes
Bureau of Sewers
Los Angeles
(President Calif. S. W. Assn.)

[For reporting the two above papers, we are indebted to A. M. Rawn, who has for a number of years served this magazine as Editorial Associate.—L.H.E.]

Pollution and Industrial Wastes

Under the presiding gavel of **George S. Russell,** Vice-Pres. of the Federation, the second session of the program (not including the joint session with the A.W.W.A. reported in our September issue) was devoted to stream pollution and industrial wastes.

Natural Stream Purification Characteristics

Studies on **"The Natural Purification Characteristics of a Shallow Turbulent Stream"** were made by the Tennessee Dept. of Public Health and the Stream Sanitation staff of the Tennessee Valley Authority under the direction of **F. W. Kittrell,** Acting Chief of the Stream Sanitation staff. These studies were reported in a paper under the above quoted title prepared by F. W. Kittrell and O. W. Kochtitzky, Jr., a junior sanitary engineer on Mr. Kittrell's staff.

The purpose of this study was to determine existing conditions and improvements needed to achieve satisfactory water qualities in the stream and also to reveal fundamental factors involved in the natural purification of a highly polluted, shallow, turbulent stream. The stream itself was 42.7 miles long, of which approximately 25 per cent were rapids and 75 per cent shallow pools which averaged 3.6 ft. deep. The average surface slope at low water stage was .96 ft. per mile and the velocity during the study was 0.7 ft. per second.

Above the source of pollution, the stream had a B.O.D. of 4.8 ppm., a D.O. of 5.3, and a M.P.N. of 41 coliform organisms per 100 ml. The pollution load consisted of domestic sewage from 28,000 persons and an industrial waste equivalent to 465,000 persons. This pollution load should have increased the B.O.D.

of the stream to 26.3 ppm., but natural purification apparently was so rapid that the maximum observed value at any station was 20.6 ppm.

Sampling stations for the study were selected at intervals of about 3½ miles in the upper 15 miles and about 13½ miles apart in the lower portion. By means of a test which indicated the presence of certain industrial wastes, it was possible to follow the flow of the river and to sample at the various stations at times equal to the respective flow times between stations. Cross sections were sampled at these stations and were composited into a sample representative of that station. Samples were collected at two-hour intervals and composited over an eight-hour period.

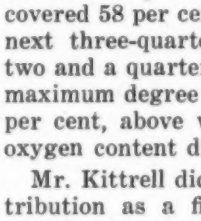
Long term B.O.D.'s were determined by allowing a large bottle of the sample to stand open to the air and taking out samples at intervals for the determination of B.O.D.'s. Mr. Kittrell presented curves to show the long term B.O.D.'s as determined in this manner for the several different stations, and it was observed that at each station there was a different value for K, the deoxygenation constant. Studies of the B.O.D. of the stream itself indicated that the K value was some ten times as high as that obtained in the large bottle tests in the laboratory. It was also observed in the field that the K value was highly variable, being quite high at the upper end and dropping to a very low figure in the lower stretches of the stream.

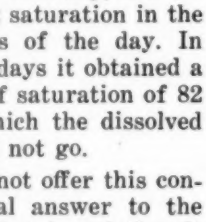
By means of an estimated curve for a deep sluggish stream, as, for example, the Ohio River, the data were compared for this shallow turbulent stream. It was very evident that the rate of deoxygenation or the rate of satisfaction of the biochemical oxygen demand was totally different in the two types of streams. The rate at which the biochemical oxygen demand was satisfied in the shallow turbulent stream was so rapid that it appears completely out of line with any previous concepts of the oxygen sag curve.

Mr. Kittrell and his associates have ascribed several reasons to this rapid purification of this shallow turbulent stream; among these reasons were the sedimentation of organic matter, the oxidation of organic matter by slime, a higher rate of oxidation in the presence of higher concentrations of food, and the anaerobic decomposition of some of the materials in sludge beds in the stream. Studies on the bacterial content indicate that the growth of coliform organisms followed the usual type of death curve—i.e., variable with the concentration of organic matter available.

It was noted that the stream reached its minimum dissolved oxygen content of 21 per cent saturation in one-quarter of a day, and recovered 58 per cent saturation in the next three-quarters of the day. In two and a quarter days it obtained a maximum degree of saturation of 82 per cent, above which the dissolved oxygen content did not go.

Mr. Kittrell did not offer this contribution as a final answer to the question it raises, but hoped that it would stimulate others to assist in the research needed to solve the problems involved in the maximum utilization of the relatively great capacities of shallow turbulent streams to assimilate pollution.





Programmers

F. W. Kittrell
Stream San. Chief
T. V. A.
Knoxville, Tenn.

Geo. E. Symons
Assoc. Editor
"W. & S. Wks."
New York

In his discussion of this paper, **George E. Symons**, Assoc. Editor of *Water and Sewage Works*, called attention to the tremendous amount of work that went into the study by Mr. Kittrell's staff, and pointed out the necessity for appreciating the difficulties that may be expected in any attempt to make a large scale experiment out of a natural stream, as well as the difficulties to be encountered in attempting to correlate laboratory and field data, particularly when one is dealing with biochemical oxygen demand. This latter observation becomes apparent when one compares the de-oxygenation constant obtained in the laboratory studies with those obtained in the field.

Dr. Symons also called attention to certain other observations in Mr. Kittrell's study, which deserved more than passing comment. For example, the proportional sampling of the cross section of the stream, and its sampling according to flow time, in spite of which precautions, the variations in the data made it impossible to make use of them all.

Probably the most outstanding observation to be made about the data, according to Dr. Symons, was the wide and rapid variation in the K values in the deoxygenation formula. Dr. Symons recalled the possible factors listed by Kittrell as including sedimentation, oxidation by slimes, anaerobic digestion, and the more rapid utilization of organic food by bacteria when the concentration of food is high. This latter proposed idea may well bear further scrutiny. It is obvious that sedimentation plus anaerobic digestion will rapidly reduce the organic content and therefore the B.O.D. of the stream, although this observation is contrary to Streeter's concept that the oxygen demand from sludge banks is equal to the oxygen demand removed by sedimentation. Certainly the presence of organic slimes on the bottom of streams with turbulent flow would tend to give a higher rate of oxidation than would occur in deeper streams.

Dr. Symons suggested another possible explanation; namely, that bacteria attacked the more easily oxidized matter first, with the less easily oxidized material being left until later. These less easily oxidizable substances may be oxidized at a slower rate. The basis for this theory is found in the studies both anaerobic and aerobic made in the laboratories of the Illinois State Water Survey by the discussor with Dr. Buswell in the years 1928 to '32. At that time it was found that the B.O.D. of soap, for example, was satisfied at a much lower rate than similar organics, sugar for example. Anaerobic decomposition of organic compounds likewise show the effects of size and complexity of the organic molecule or its bacteriostatic effect.

Mr. Kittrell's paper has cited the number of difficulties of stream pollution study, and his plans for future studies on a stream in which the pollution load can be controlled will certainly be of great interest and value to engineers, chemists, and all others interested in the subject of stream pollution.

Waste Disposal vs. Industrial Costs

"The Effects of Sewage and Waste Disposal Practices on Industrial Operating Costs" are factors not often considered by sanitary engineers concerned with the disposal of sewage or industrial wastes, according to **William J. O'Connell, Jr.**, Cons. Chemical Engr. of San Francisco. Mr. O'Connell pointed out that one of the costs of operation

to industry is the cost of water supply and that quite frequently insufficient attention has been paid to the source of supply and the effect of pollution thereon in its relation to the cost of that water to the industry.

Mr. O'Connell carries the firm conviction that municipalities should treat sewage in such a way as to reduce the cost of treatment of water from the receiving stream for industry and at the same time develop an equitable cost to both. In other words, Mr. O'Connell believes that by a careful analysis of the situation with regard to waste disposal from a municipality or an industry and its effect on the water supply of a down stream industry, some combination can be reached which will produce the most equitable cost of operation both for the waste disposal and for the industrial supply.

As an example of what lack of proper waste disposal may mean to an industry, Mr. O'Connell cited the case of a power plant which was using a partially polluted water supply. Because of this pollution, the power plant had to use considerably more chlorine to keep down slime growth in the condensers. At the same time such slime growth as did develop cut the efficiency of the cooling system to the extent that it required one to two per cent more fuel to produce the power output, and, at the same time the maintenance of condenser tubes was increased.

In another instance, a power station had to use more cooling water because of waste heat discharged above it. The cost of chlorine in this plant is $10,000 a year, whereas it should be about $7,000 a year, and the plant burns 85,000 barrels of oil extra a year in order to produce its power output, simply because the cooling water which it receives is not of good quality.

Mr. O'Connell classified water as mountain stream, underground, river, and harbor. Harbor waters are used for steam generation cooling, for fish fluming, and for the recovery of salt, magnesium, and bromine. Much of the pollution of the latter waters is from municipal sewage, and Mr. O'Connell emphasized that if this municipal sewage were properly treated, cost of operation of these three types of industry using harbor waters would be decreased. He cited figures to show that proper treatment of the waste plus proper treatment of the water supply would make it possible for fish canneries to operate at one-half the cost for water that is now expended.

In the discussion of this paper, **Herbert C. Davis**, Pres., Terminal Islands Sea Food Ltd., and Chairman of the Committee on Water Supplies and Waste Water Disposal of the California Fish Canners' Assoc., said that O'Connell's cost for fish pack was too low. He had given only the cost of the water supply and its treatment and had omitted certain factors of overhead. Mr. Davis is of the opinion that it is the growth of cities which has affected the water for industries which were originally established, and he believes that the cities should clean up their own wastes first before asking industry to do likewise. Then he believes that the municipalities should tell the industry what endpoint is wanted and give the industry an opportunity to develop waste treatment within their own plants.

Programmers

L. F. Warrick
State San. Engr.
Madison, Wis.

C. W. Klassen
State San. Engr.
Springfield, Ill.

Cannery Wastes

"Solving Cannery Waste Problems" is not too difficult if one uses the cooperative approach, according to **L. F. Warrick**, State San. Eng., State Bd. of Health, Madison, Wis. One of the difficulties of solving these problems is the heavy increase in the canning industry. For example, in 1940 there were 170,000,000 cases packed; in 1945, 232,000,000 cases; and in 1946, 266,000,000 cases. Most of the waste from this industry occurs in the summer when the streams are low and cannot handle the waste.

Types of waste from the canning industry include cooling tank waters which are generally clean, pea or corn solids, gross solids, and processing water with a high organic content. Mr. Warrick cited waste characteristics of peas, corn, and beets, giving their volumes of strength and the population equivalent per hundred cases. The population equivalent of peas and other wastes varies from 35 to 480 per 100 cases.

Mr. Warrick proposed four steps in solving the cannery waste problem. The first of these is to remove the gross solids, the second to prevent spills, the third is to install fine screening, and the fourth to install treatment of the organic waste.

Treatment may consist of chemical precipitation, lagooning, biological filtration, or treatment in municipal plants with sewage. Mr. Warrick's paper gave variations in the amount of coagulant needed for different types of waste when treated by chemical precipitation and the amount of nitrate required in lagooning as well as methods of operating biological filters and lagoons.

At the conclusion of the paper, Mr. Warrick presented a motion picture showing the various types of treatment in food canneries, fruit and vegetable canneries in Wisconsin, and the methods used for treatment.

In the absence of **C. W. Klassen**, Chief San. Eng. of the State Dept. of Pub. Health, Springfield, Ill., his discussion of Mr. Warrick's paper was read by S. C. Martin, Asst. Secy. of the Federation. Mr. Klassen's remarks were confined largely to the discussion of lagooning which has proved highly satisfactory in Illinois. Mr. Klassen does not consider chemical precipitation as satisfactory for corn and pea waste based on experiences in Illinois.

In the use of lagooning as a treatment, the basic premise seems to be to satisfy 20 per cent of the 5-day B.O.D. by means of sodium nitrate. Slides were presented showing an installation of a lagoon at Rochelle, Ill., and data on the operation of this lagoon were given. Sampling was described and the chemical results obtained.

In summary, Mr. Klassen reiterated his statement that lagooning had been satisfactory for the treatment of wastes in Illinois.

California's Industrial Waste Committee

The California Sewage Works Association has a Committee on Industrial Waste, under the chairmanship of **W. T. Knowlton**, Cons. San. Eng. of Los Angeles. Mr. Knowlton, reporting on the activities of the committee, briefly reviewed the report of the committee on the pro-

cedure for handling industrial waste and discussed the effect of industrial waste on treatment plants. He suggested that industrial waste should be studied in order to determine and allocate costs, and that the municipality and the industry should consider methods of treatment and disposal cooperatively in arriving at the ultimate solution of the problem. Special charges to industry are warranted in many instances and under various conditions.

Mr. Knowlton also explained the makeup of his committee, and how he proposed to publicize the work of the committee through its membership by contacts with the League of California Cities, various chambers of commerce, the Public Health Association, and the sections of the California Sewage Works Association.

Mr. Knowlton desires a legislative committee to set up legislation for the control of industrial waste disposal.

Symposium on B.O.D.

(Chas. Gilman Hyde, Presiding)

"Manometric Measurement of B. O. D. of Domestic and Industrial Sewage"—by W. F. Langelier, Prof. of San. Eng., Univ. of Calif., and David H. Caldwell, Brown & Caldwell, Chem. Engrs., San Francisco.

This paper described work done in the Sanitary Engineering Laboratory at the University of California in the adaptation of the Warburg and other manometric apparatus to the estimation of B. O. D. The authors stressed the deficiencies of the standard dilution method and were enthusiastic in their appraisal of the several manometric methods described. The well-known Sierp apparatus used in B. O. D. testing employs a manometer and must be classed as manometric, but the authors regard it as the form least suited for routine work where a number of determinations are required. This apparatus also lacks the precision and convenience of the other forms described. The recommended apparatus comprises a water bath equipped with a shaking mechanism to which are attached as many as 13 sample flasks, each with a manometer for indicating changes in gas volume.

Data were presented which were interpreted as showing that the apparent constancy of the k-value obtained with the standard dilution technique is due in part to the extremely narrow range of permissible demand in the diluted sample. When undiluted sewage is tested under the conditions of constant aeration and mixing at 25° C., as in the recommended apparatus, the oxidation rate is increased so that the "half-ultimate" first stage B. O. D. is obtained in less than 24 hours. In general, the 24-hr. values were found to equal approximately 75 per cent standard 5-day values at 20° C. The onset of nitrification will depend upon the history of the sample and even with fresh crude sewage can occur as early as the end of the third day.

The manometric apparatus is particularly well suited for the estimation of the demand of individual trade wastes and for measuring the activity of activated sludge and filter slimes. The technique involves the testing of undiluted sewage with and without the addition of the waste and therefore solves in a most appropriate manner the problem of seeding.

Programmers

Wm. J. O'Connell
Cons. Chem. Engr.
San Francisco

R. G. Tyler
Prof. San. Eng.
Univ. Washington

A similar method can be used for testing the activity of activated sludge or filter slimes. The method is based on the principle that the demand of the sewage-sludge mixture will be greater than the sum of the individual demands of the sewage and sludge determined separately.

"Bio-Chemical Oxygen Demand of Sulfite Waste Liquor" by R. G. Tyler, Prof. of San. Eng., Univ. of Washington, Seattle, Wash., was a paper describing some of the studies on the bio-chemical oxidation of sulfite liquor carried on at the University of Washington. Chemical analyses of typical samples of sulfite waste liquor were shown. The theoretical oxygen demand was computed for the chemical materials in the sample and compared with the actual bio-chemical demand. The theoretical oxygen demand was approximately 150,000 ppm., while the actual bio-chemical oxygen demand was only 50,000 ppm. The lignins present in the waste accounted for most of the theoretical bio-chemical oxygen demand. However, the lignins, which are not readily oxidizable were not an important part of the actual bio-chemical oxygen demand. The sugars and other readily oxidizable material which were a small part of the theoretical bio-chemical oxygen demand accounted for most of the 50,000 ppm. actual bio-chemical oxygen demand.

Prof. Tyler discussed the importance of different types of dilution waters on the bio-chemical oxygen demand test for sulfite liquor waste. The proper seeding of test samples of sulfite liquor waste for bio-chemical oxidation was shown to be most important. Sewage organisms, river water organisms, and soil organisms were used as seed. Soil organisms proved to be the most satisfactory. Seeding was shown to greatly effect the lag and bio-chemical oxygen demand at any time. The immediate oxygen demand of sulfite liquor and the effect of Sulphur Dioxide on the dissolved oxygen determination were discussed. The determination of dissolved oxygen by the Polargraphic method yielded the best results.

"The Effect of Temperature on the Bio-Chemical Oxidation of Sewage" by Harold B. Gotaas, Prof. of San. Eng., Univ. of California, Berkeley, Calif., was a paper reporting results of the research studies on the oxidation of the same sewages at 5°, 10°, 15°, 20°, 25°, 30°, 35°, and 40° C. The value of the reaction velocity, K, at 20° C was found to average approximately 0.19 for the different sewages as compared to the commonly accepted value of 0.1. The values of K, at the different temperatures were higher than commonly accepted values in the temperature range 5° C.—30° C. Approximately 30° C. is the optimum temperature for the maximum rate of Bio-chemical oxidation, and K becomes smaller as the temperature increases about 30° C. Another critical temperature occurs at about 15° C. Using the Phelps formulation for the relationship of K to temperature, it was found that a direct relationship exists between the logarithm of K and the logarithm of the temperature in degrees centigrade.

The results of this study show that changes in temperature have no appreciable effect on the value of the ultimate first stage of bio-chemical oxygen demand. The ultimate first stage demand is the same at 5° C., at 15° C., and at 25° C. It requires a longer time for the first stage demand to be reached at a lower temperature than at a higher temperature, but if given sufficient time the first stage demand will be the same.

This differs from the commonly accepted idea that L is increased or decreased 2% of the 20° C. degree ultimate first stage demand for each degree centigrade change in the temperature of incubation above or below 20° C.

Programmers

W. F. Langelier
Prof. of Chemistry
Univ. of Calif.

H. B. Gotaas
Prof. San. Eng.
Univ. of Calif.

[For the reporting of the Symposium on B.O.D. we are indebted to Prof. H. B. Gotaas of the Univ. of Calif.—L.H.E.]

*Operators' Forum**

(Fred. C. Nelson, Presiding.)

A full session was devoted to papers and discussion concerning problems of maintaining sewerage systems, the effect of industrial wastes on sewage treatment plants, and the salaries of sewer maintenance and treatment plant personnel. Chairman of this symposium was Fred. C. Nelson, Manager, Pacific Division, The Dorr Co., Los Angeles, Calif.

"Experience of an Old Time Sewerage System Operator," by D. R. Kennedy, Supt. of Sewers, Long Beach, Calif.

Mr. Kennedy described the basic problem involved in keeping sewers open and the problems involved in the removal of stoppages. At Long Beach, the use of rubber beach balls to clean the smaller sewers mechanically has produced results far beyond expectations. This method has been described by A. M. Rawn in the 1943 Reference and Data Number of *Water Works & Sewerage.*

One of the most difficult considerations has been the control of hydrogen sulfide generation in sewers. While chlorination is particularly effective, it became evident after starting this treatment that additional measures would be required. Sewer ventilation was attempted by blowing air into the manholes. When the city of Los Angeles found the application of Cloroben to be a promising means of hydrogen sulfide control, this treatment was tried at Long Beach. Dosing stations, to apply 1.0 ppm. Cloroben at considerable distances upsewer from the sewage pumping station were established. The results to date prove a long contact time (2.5 to 3.0 hours, at least) is essential for the successful use of this treatment. Over a period of several months, observations have indicated periodic mechanical cleaning in conjunction with the application of Cloroben will control slime growth and the production of hydrogen sulfide.

The city of Long Beach is in a petroleum field area and explosive hazards have been created more than once when gasoline entered sewers. Mr. Kennedy stressed prevention of difficulties, rather than their cure after the difficulties had arisen. He advocated more attention to sewer system maintenance—especially in smaller communities.

This paper was discussed by **Ewald E. Lemcke,** Maintenance Engineer, Orange County Joint Outfall Sewer, Anaheim, Calif., who presented an extensive review of experience relating particularly to sewers which produce very high sulfide concentrations. The application of chlorine at up sewer points where the sewage is relatively fresh was tried in 1928 and is still the most generally successful method.

Many other control methods and materials have been investigated: Ozone was used with no results; Ferrous Sulphate (copperas) showed fair results but was difficult to apply; Ferrous Chloride proved effective in strong sewages, but also proved expensive; Zinc Chloride has been used with fair results; Cloroben appears to possess little effectiveness in strong sewage; Trichlorophenol has excellent odor-masking qualities; Sodium Nitrate has shown good results but is relatively costly; Lime application is quite satisfactory. At present a combination of chlorine and lime treatment is used in gravity sewers.

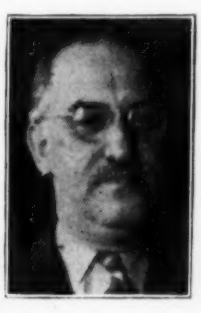
A. A. Appel, City of Los Angeles, described the good control of hydrogen sulfide and the drying of slime growths in sewers which has resulted from Cloroben treatment in Los Angeles. **Arthur Pickett,** Industrial Waste Engr., Los Angeles County, Engr's. Office, reported on damage to installations in Los Angeles harbor which can be traced largely to discharges from oil refineries. Waste water from this source contained from 20 to 40 ppm. sulfides; while costly installations have been made to pretreat these wastes for removal of hydrogen sulfide, concentrations of up to 10 ppm. hydrogen sulfide still remain in the channel. It is now believed that sulfate-splitting bacteria are responsible for this condition and that bacterial control may well be the solution.

"Maintenance of Sewage Collection Systems," by Don C. Davis, City Engineer, Turlock, Calif.

In contrast to the specialized organization possible in large municipalities, Mr. Davis pointed out that, as in a town the size of Turlock (population 6,000), the city engineer of a small community must be a "general practitioner." Only through the maintenance of adequate records can he determine the proper frequency of cleaning, and when joints or roots or sludge deposits should be investigated. He maintained that the sewer department has done a good job when residents are never aware of their sewers.

Whenever possible, the use of vitrified clay pipe rather than cement pipe should be advocated in localities where a hydrogen sulfide problem exists. Pumping stations should be adequate to prevent odors produced by decomposition. Sewer installations should be under the supervision of a competent engineer—and the work should be checked to be certain that proper sewer grades have been followed. Next to a well constructed pipe line, the best investment is a good plumbing ordinance. With intelligent prohibitions against the admission of undesirable types of waste, the enforcement of regulations is equally essential. In fact, constant vigilance over all maintenance problems will be found to produce the best results.

Discussing this paper, **A. Segel,** City Engineer, Fresno, Calif., considered maintenance problems fundamentally similar in all municipalities. In spite of a city ordinance against the discharge of grease, and the



Programmers

R. F. Brown
Supt. Maintenance
Bureau of Sewers
Los Angeles

Morris M. Cohn
City San. Engr.
and Supt.
Schenectady, N. Y.

*The Operators' Forum was reported by Harry A. Faber, Editorial Associate.

presence of grease traps, a large quantity of caked grease is removed from a sewer in Fresno. It is now required that all industrial wastes be pretreated before admission to the city sewers.

An unusual and difficult problem is created by the presence of millions of cockroaches in the city sewers. While these have been controlled by spraying a special powder, a health hazard exists because the roaches may enter inadequately trapped house connections. Sewer cleaning devices found effective include a collapsible canvas umbrella which flushes through a sewer and pulls a steel wire brush. Trucks equipped with radio have been helpful in maintaining service.

"Salaries of Sewer Maintenance and Treatment Plant Personnel," by Ruben F. Brown, Superintendent, Sewer Maintenance Division, Los Angeles, Calif.

Mr. Brown called attention to the fact that one of the objectives of the Federation of Sewage Works Associations is the proper training and compensation of operators. He believes that proper recognition and salaries can best be attained through action by the Federation in classifying systems and types of treatment plants and the duties of operators. In discussing the certification and licensing of operators, it was made apparent that good pipe line operation (sewer maintenance) may be considered as important as treatment plant operation, but little recognition is generally given to the first type of operation.

In evaluating the benefits of public employment, Mr. Brown listed sick benefits, vacations, sick leaves, etc., but pointed to salaries as generally below those in comparable industrial positions. A recent survey of 360,000 jobs in the city and county of Los Angeles has resulted in some adjustment in city positions as part of the purpose of arriving at equitable salaries. Standardization of this type could be applied to classification of jobs in sewer maintenance and sewage treatment. For example, the operator of a small sewage treatment plant, in Mr. Brown's opinion, should be paid proportionally for the percentage of his time spent in clerical work, as pump operator, as electrician, as foreman, etc. The operator's job, in other words, is considerably broader than the name indicates. Mr. Brown considers that a standard average compensation scheme can be devised by the Federation to recognize responsibility.

Session Chairmen
Chas. Gilman Hyde
Consulting Engr.
Berkeley, Calif.

Forum Chairman
Fred. G. Nelson
Pacific Coast Mgr.
The Dorr Co.

His recommendations toward this end included: Certification of operators by State Health Departments; a good public relations program; an in-service training program sponsored by the State Health Department; the adjustment of salaries comparable with those of industrial positions; and well defined methods and standards of manitenance and operation.

This paper was discussed by **Morris M. Cohn,** Editor of *Sewage Works Engineering* and City Sanitary Engineer, Schenectady, N. Y., who considered that the present industrial approach to municipal work has improved both rates of pay and working conditions. Recognition and salary in municipal operations must continue to increase, since these positions compete with those in industry.

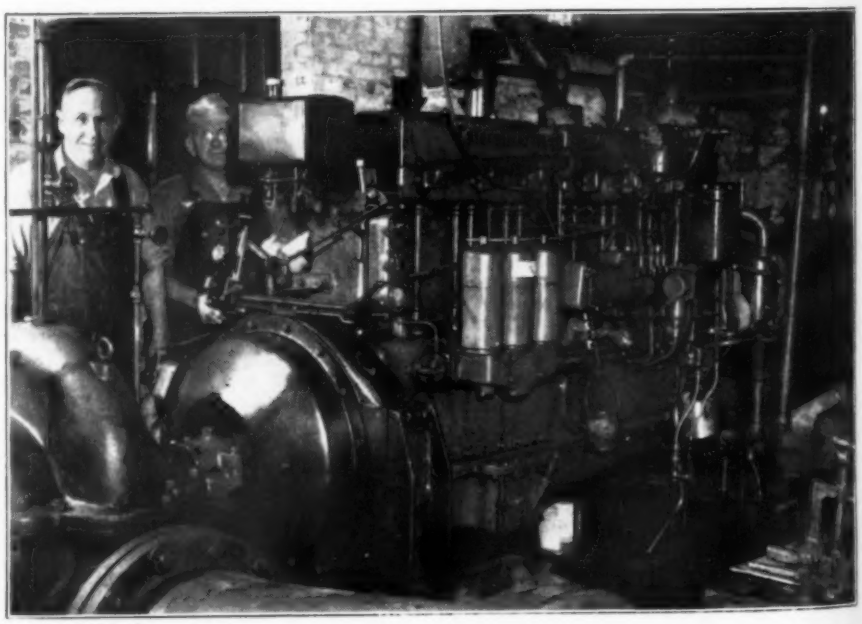
No standard rate of salaries exists for sewer maintenance and sewage plant operators—hence, the gap between salaries for these positions and for other specialized labor is frequently very great. However, municipalities are now generally making salaries more proportional to rising costs of living. Certain service benefits and, in some instances the provisions of retirement income, do contribute to the desirability of municipal positions.

TAUNTON, MASS., AUGMENTS SUPPLY WITH DIESEL DRIVEN PUMP

Before the war, Arthur C. King, Supt. and Clerk of Water Board, Taunton, Mass., had no trouble supplying his customers with all the water they needed from Elders Pond. Came the war and Camp Myles Standish, within the city limits, plus increased industrial activity and the water supply of Elders Pond was practically pumped dry.

Emergency measures to head off the possibility of pumping the source of supply dry were taken and the pipe line was laid to nearby Asawompsett Lake. A centrifugal pump was installed on this line, and as motive power a Caterpillar Diesel D13000 was installed. This system provides six million gallons of water and the engine runs 24 hours daily with a shut down of three hours every ten days for oil change.

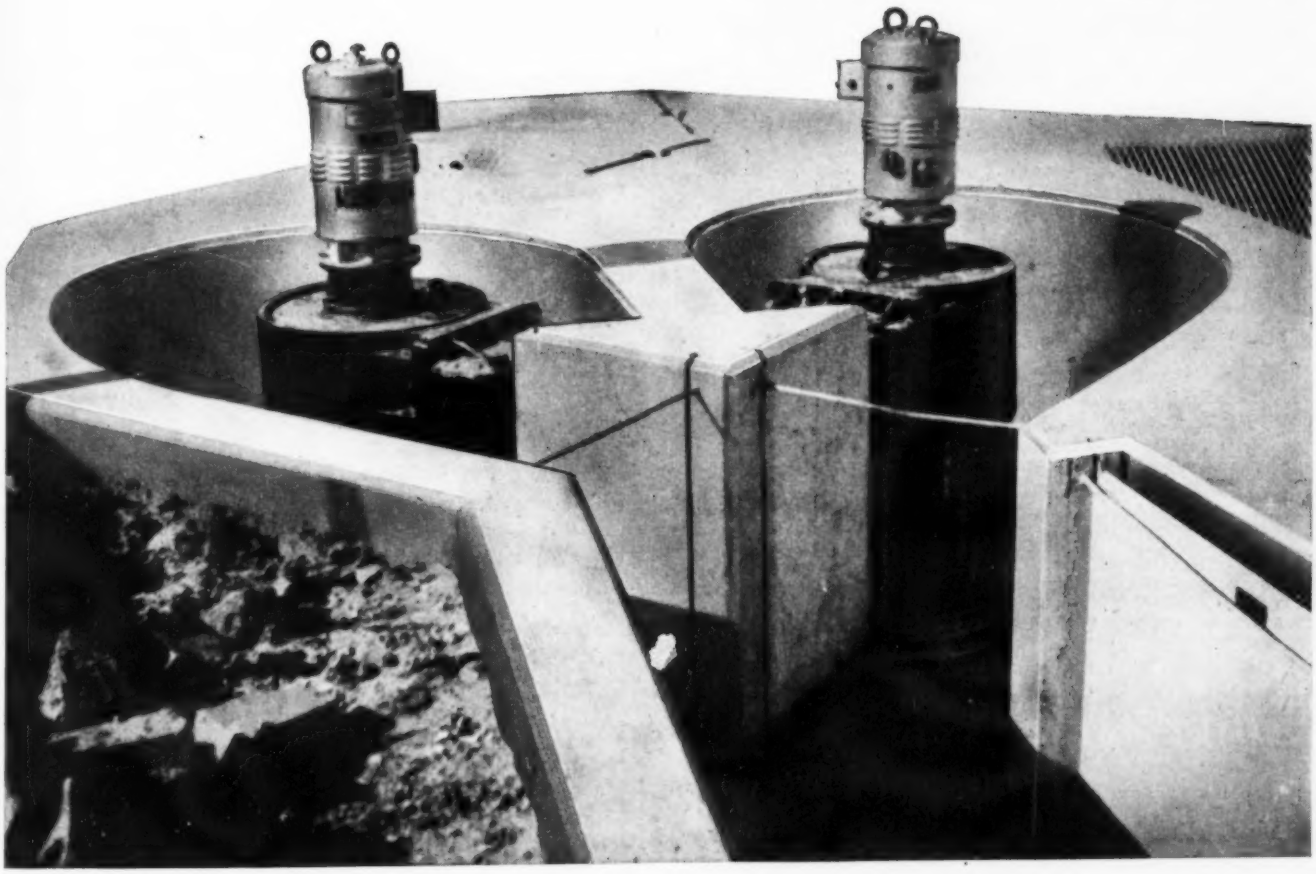
The water is pumped from Asawompsett Lake to Elders Pond which still acts as supply source for city.



Caterpillar Diesel Driving 6 mgd. Pumps to Augment Supply

Comminutors are Standard Equipment for Screening and Cutting Sewage Solids

Because-



- It cuts sewage solids into small particles that will pass through the drum slots.
- Scientifically designed and engineered — close tolerances insure shearing of rags and stringy material.
- Stellite cutting edges provide long, abrasion-resistant life.
- Comminuted particles settle rapidly . . . improve sedimentation and sludge digestion.
- Labor costs reduced . . . no raking, removal, hauling, burial or incineration of foul screenings.
- Lubrication, periodic inspection and cutter sharpening only maintenance required.
- Fly nuisance, odors and unsightly appearance eliminated.
- Power requirements negligible. Inertia effect of drum does cutting.
- Housing not required . . . comminutor is designed for all-weather outdoor service.
- Comminutors in operation continuously for more than fifteen years, establish their dependability. More than 1500 installations to date.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2349 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

MEETINGS SCHEDULED

Oct. 16-17—OCEAN VIEW, VA. (Hotel Nansemond)
Virginia Industrial Wastes & Sewage Works Assn. (First Annual Conference). Sec'y-Treas., A. H. Paessler, 815 E. Franklin St., Richmond 19, Va.

Oct. 16-17—HARRISBURG, PA. (Hotel Harrisburger)
Penna. Municipal Authorities Association. (5th Annual Conference). Sec'y-Treas., Claude E. Fogelman, 1717 Main St., Northampton, Pa.

Oct. 23-25—MILWAUKEE, WISC. (Hotel Schroeder)
Wisconsin Section A.W.W.A. Secretary, L. A. Smith, Supt. Water Works, Madison, Wisc.

Oct. 27-28—JEFFERSON CITY, MO. (Governor Hotel)
Missouri Section A.W.W.A.
Missouri Water & Sewage Conference.
Sec'y-Treas., W. A. Kramer, State Board of Health, State Office Bldg., Jefferson City, Mo.

Nov. 3-5—ATLANTA, GA. (Biltmore Hotel)
Southeastern Section A.W.W.A. Sec'y, W. T. Linton, State Board of Health, Wade Hampton Office Bldg., Columbus, S. C.

Nov. 6-8—ATLANTIC CITY, N. J. (Hotel Claridge)
New Jersey Section A.W.W.A. Sec'y-Treas., C. B. Tygert, Box 178, Newark, N. J.
(Joint meeting with)
South Jersey Assn. Water Supts. Sec'y, Walter Spencer, 2707 Bethel Ave., Merchantville, N. J.

Nov. 10-12—GREENSBORO, N. C. (Sedgfield Inn)
North Carolina Section A.W.W.A.
North Carolina Sewage Works Association. Sec'y-Treas., Geo. S. Moore, P.O. Box 125, Albemarle, N. C.

Nov. 12-14—PITTSBURGH, PA. (Hotel Wm. Penn)
Engineers' Society of Western Penna. (8th Annual Conference) Gen. Chairman, H. M. Olson, Wm. Penn Hotel, Pittsburgh, Pa.

Nov. 17-18—ROANOKE, VA.—(Hotel Roanoke)
Virginia Section A.W.W.A. Sec'y-Treas., W. H. Shewbridge, 708 State Office Bldg., Richmond, Va.

Nov. 19-21—WASHINGTON, D. C.—(Wardman Park Hotel)
Four States Section A.W.W.A. Sec'y-Treas., W. A. Welch, 748 Public Ledger Bldg., Philadelphia, Pa.

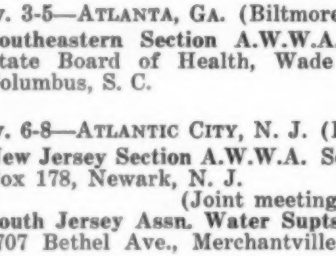
Nov. 20—BOSTON, MASS. (Statler Hotel)
New England Water Works Assn. Sec'y, Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

Nov. 20-22—ST. PETERSBURG, FLA. (Suwannee Hotel)
Florida & Cuban Sections A.W.W.A. (Joint Meeting) Sec'y Fla. Section, A. P. Black, University of Florida, Gainesville, Fla., Sec'y Cuban Section, Laurence H. Daniel, Box 531, Havana, Cuba.

Dec. 10—WINTHROP, ME.
Maine Water Utilities. Sec'y, Earle A. Tarr, Winthrop, Me.

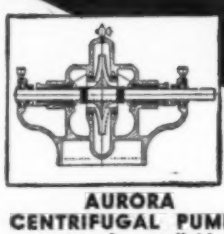
Dec. 18—BOSTON, MASS. (Statler Hotel)
New England Water Works Assn. Sec'y, Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

BUILT for DEPENDABILITY



AURORA HORIZONTALLY SPLIT CASE DOUBLE SUCTION SINGLE STAGE CENTRIFUGAL PUMPS "by Aurora"

SERIES TYPE OD



The ultimate in design and perfection — type OD pumps — in capacities to 4,000 G.P.M. and heads to 300 ft. — are accessible, compact and lasting. They are widely used for general water supply, for municipalities, industrial buildings and institutions. Also for handling condenser circulating water, liquids in paper mills and distilleries, chemical solutions, oil in oil fields and refineries, irrigation, etc.

AURORA CENTRIFUGAL PUMPS — are also available in HORIZONTALLY SPLIT CASE TWO STAGE DOUBLE SUCTION • SIDE SUCTION • VERTICAL • NON CLOG • SUMP • MIXED FLOW • DEEP WELL TURBINES • and SPECIAL DESIGN.

Write for CONDENSED CATALOG "M" or CONSULT SWEETS

APCO TURBINE-TYPE PUMPS

Here's the Pump for "1001" duties. SIMPLE — only one moving part, the impeller. Capacities to 150 G.P.M., Heads to 600 Ft. Slight change in capacity against drastic head variations.

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BACKGROUND OF ENGINEERING TRAINING AND EXPERIENCE, BUSINESS, MANAGEMENT, SALES AND PROMOTION, ADVERTISING, DEVELOPMENT AND INVENTION AVAILABLE IN ONE MAN—

Age, 46; 5 ft. 9 in.; weight 168 lbs.—Active physically and mentally. Adaptable, aggressive, hard worker.
Married. One son, Sophomore at Northwestern University. One daughter, Sophomore at North Park Academy.
Special skills are invention, development of new uses and applications for existing products, and improvement of same; mass sales promotion and national advertising planning, creating and managing sales agency organizations, executive and management work of widely varied type and scope including office, shop and field phases.
Have 1947 Nash Ambassador automobile for business use.
Available immediately on either temporary or long-term contract, preferably with Chicago headquarters. Not averse to travel within reason.
Past experience includes the following:
1922, June, B.S. in M.E., Armour Institute of Technology (now Illinois Tech.)
1922, June to 1924, Sept.—2½ years—sales, advertising and executive work on technical publication serving railroad and industrial fields.
1924, Sept. to 1925, June—9 mos. Post-Graduate Course in L. A. & S. and Engineering Schools, Univ. of Illinois.
1925, June to 1926, Sept.—1¼ years—estimating, service and sales on high pressure water tube boilers in large Chicago buildings.
1926, Sept. to 1927, Jan.—1-1/3 years—employed by Consulting Engineering firm as Junior Engineer on time-studies and production planning, surveys, reports, etc. in industry.
1927, Jan. to 1929, Nov.—2 years—Manager of Sales, Stoker Division, initiating nationwide sales and service organization.
1929, Nov. to 1932, March—3-1/3 years—service, installation and sales proportioning equipment for treatment processes in oil refineries calling on major oil refiners in ten central states, from Chicago office district headquarters.
1932, Mar. to 1933, Sept.—1½ years—founded successful firm in water works equipment field and invented and patented chemical feed pumps and installed same in railroad, industrial and municipal service.
1933, Sept. to 1947, July—14 years—formed corporation—was largely responsible for building up sales from "scratch" to a leading position in chemical feeder field, with 1942 volume attaining 1½ million dollar sales. Active in all phases of organization work, design, installation, service, correspondence, sales, production, expediting, management, advertising, planning and executive work, government contracts, etc. Nine of these years in employ of one firm.
Reference as to character, past business relationships and financial reputation upon request.

Box 112—Water & Sewage Wks.
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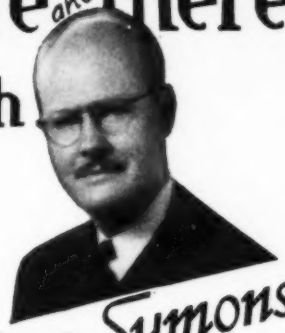
Here and There with Doc Symons



H. T. M. A.—And this month, in response to several requests (three, to be exact), I'm going to finish the story of the San Francisco conventions—Next month, back to the usual sprightly (?) banter, but now to continue my impressions of the conventions, there were—

* * *

The Eating Places, which drew their share of everyone's attention, mine included. Besides veal scalopine at Julius Castle, I recall with pleasure a wonderful filet mignon at the Domino Club with its walls lined with paintings designed mainly to attract the male eye. Amidst all that nudity, one picture stood out—a large canvas of three negroes playing poker in a shack lighted by a candle in a beer bottle. The old man was obviously losing, mainly because of the adeptness of the younger two at passing cards with their toes.

For fish, I tried Bernstein's Fish Grotto, and for smorgasbord, luncheon at the Starlight Roof atop the Sir Francis Drake Hotel. For a hurried sandwich between convention sessions with "Kit" (T. V. A.) Kittrell, Leon (Madison, Wis.) Smith, and Dick (Los Angeles) Pomeroy, the Whitcomb Coffee Shop had good tuna fish, and the ham and cheese at Maison Paul was quick.

For breakfast, the 12-oz. glass of fresh orange juice for a quarter at the Golden Pheasant was the top bargain of the trip, and for a midnight snack with the Harry (Chlorine Institute) Fabers, the Mayflower Donut Shop was adequate.

Liquid sustenance was dispensed in such delightful places as the Merry-Go-Round Room of the Fairmont Hotel, the Cirque Room, Starlight Roof, the Orchid Room of the St. Francis, where the back bar was hung with dozens of live orchids and where I saw Morton Downey and

for permanent satisfaction— specify

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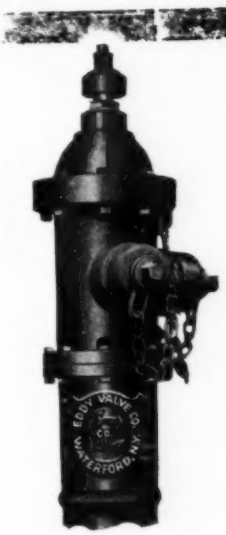
VALVES & HYDRANTS



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We have the valve or hydrant you want—chances are we have it in stock ready for immediate delivery. Specify EDDY — for "Permanent Satisfaction".

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WATERFORD, NEW YORK

Charlie Winninger of theatrical fame.—And of course there was the one and only Top of the Mark, where the view alone is worth the price of a drink—or two.

* * *

Places I didn't go, and things I didn't see (but you might have) were Bob Grison's Chicken House; the Omar Khayam; The Forbidden City; Cathay House; Pinnochio's, where the entertainers were different, to say the least; Joe DiMaggio's, and many others.—I didn't ride in an elevator with Red Skelton as did Bennie (Mrs. L. E.) Harper of the Omega Harpers—I didn't see Art Welsh have a sun stroke after visiting Hoover Dam, and I missed the sight of Hilo Hattie teaching Tom Veatch, Harry Jordan, Pete Wisely, Fritz Friel and other convention brass to wiggle—the Hula.

* * *

It was rumored around the convention floor that when Pete (Federation) Wisely saw the well house (of the "Meet Me at the Well" slogan) he suggested that there should be a "Chic Sale" at the other end of the room, but Art Clark of the Mfrs. Assn. said, "No, it might pollute the well."

* * *

Convention Kaleidoscope. — The 102 exhibits that overflowed the auditorium hall—the largest group of water and sewage works personnel ever gathered together—speakers who shouted into microphones and speakers who whispered away from the microphones—Harry Jordan's serious expression as he scanned one of the sessions looking for someone—the "small" attendance at the Sewage Works Federation banquet and the two empty chairs out of 800 at the A.W.W.A. banquet —Bill Orchard in his gleaming white suit (with blue tie, blue handkerchief and blue boutonniere) emceeing the Gala Night of Fun—John Gill's singing as well as that of his protegé—that breath-taking Chinese acrobatic act with one member doing handstands on top of eight chairs supported far below on four ginger ale bottles—the two piano team, and the comedian whose voice, patter, delivery, punch line and harmonica playing sounded exactly like Herb Shriner of radio fame.

Kenny (W & T) Kiern, Jr., whose bow tie lighted up when you shook his hand—Wendell LaDue's crack that everyone at the banquet looked like California because the women looked like Hollywood beauties and the men at least like '49-ers—the irrepressible Reuben (Daredevil) Brown, projecting the seal of the City of Los Angeles on the wall of the F.S.W.A. banquet room—the Central States Sew. Wks. Assn. walking off with the Man-Miles Cup again and putting an end to that competition—the harder the seats became as the sessions wore on—

Vic Weir's admission that all he saw on the drive out from St. Louis County was the white line down the center of the road—other travelers by auto, Lou Warrick and his trailer, A. M. Buswell, Bill (Am. City) Foster—Room-hopping at the hotels after the various functions—Meeting another member of the Meter Box Ford Clan, Rosemary, who is much prettier than John, Dick or Wilbur—Realizing again and again that there are still a lot of speakers who should hear Doc Symons' after-dinner speech on "The Audience Talks Back"—the mad rush of the women on Thursday to "get their hair done," attend the bridge party, and dress for the cocktail parties and the banquet (a large day, indeed)—

Freezing weather! Inadequate heating! These factors need not load up your meter shop with repair jobs. The frost bottom in American or Niagara water meters patented in 1921 and improved in 1938 prevents costly damage.

When ice forms in the meter and expansion takes place, the low cost bottom casting breaks, relieves pressure and allows all working parts including the gears to move with the ice. Damage is limited to the frost bottom. By replacing the bottom, on the spot, the meter is again ready for service.

The breaking point is carefully controlled and checked in advance by pressure tests at the factory.

The advantages of frost bottom meters are available to you at no extra cost.

Write for the full story on these meters that have become standard in many communities where temperatures drop below freezing.

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Simplicity

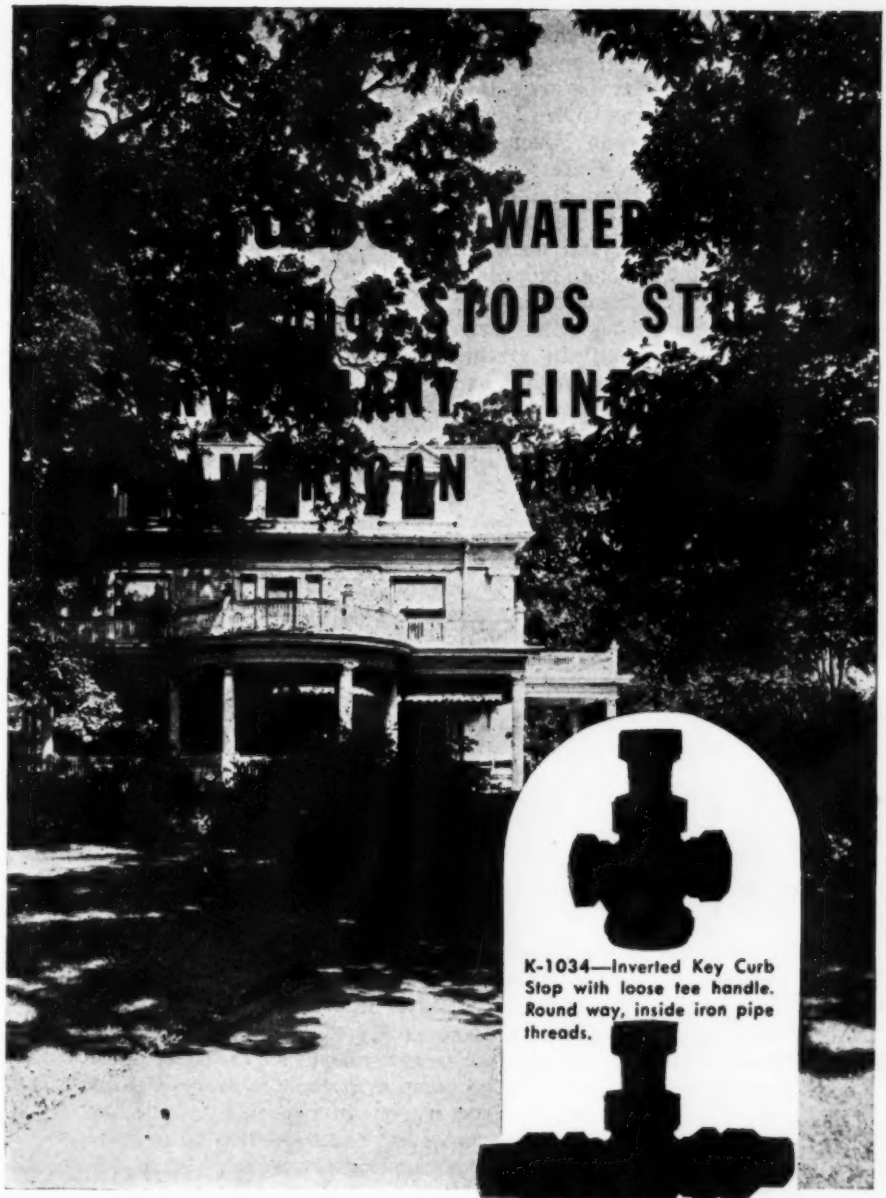
Abel Wolman's talk on "Mass Medication by Water Treatment" and Fritz Friel's remark that it was Mrs. Friel who had called his attention to how pretty the girls were (with all that beauty in his own home, Fritz doesn't think of looking elsewhere) —the wonderful and strange Hawaiian flowers flown in from Honolulu for the occasion, and the heavy spicy scent of the leis—the man in the elevator who asked a strange lady what perfume she was wearing —The Nuchar and U. S. Pipe prebanquet parties—The McWane movies of conventioneers in color—The serious mien of the recipients of the various awards as they stood below the president listening to their respective merits being extolled—The Coca Cola bar with free "cokes" on the house (The W.S.W.M.A.)—the absence of some well known faces like Bill Piatt, Jim Rumsey, Clarence Klassen, Bert Berry, Allan Darby, Paul Weir, and many, many others—the presence of many faces new to me and other non-Californians—and the—but space grows short and I have to hurry to make—

* * *

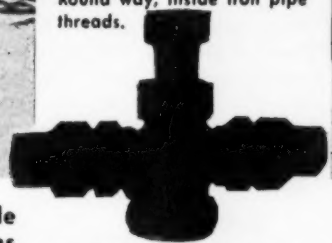
The trip back east, with some forty others who came straight home. I understand that we missed a wonderful trip by not going with Earl (P.R.R.) Biddle on his tour of Glacier National Park, etc.—but we had Conductor Nuchar Sigworth, he of the Transportation Committee, to look after us—and for entertainment we could watch one of the Pee Bee's bridge games—I watched one in which Sigworth playing with Charlie (De Laval) Coleman bid and made a grand slam because Mike Glace threw away the wrong card on the twelfth trick (Harry Lendall was the unhappy partner). Other bridge addicts were the Hutton's, Bonyun's and Bill Brush's, Joe Wafer, Sol Seid, and several other Pee Bees—I don't know whether or not it was the result of a bridge argument, but both Dick and Mrs. Bonyun had repaired their broken glasses with pieces of gum—perhaps on the next trip, Sig, you should take an optometrist and a physician—When we weren't watching the bridge games we could look at—

* * *

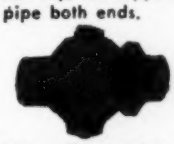
The scenery, which differed from that on the trip out. We came back by the Feather River Canyon, but didn't see it because it was night. Our train ran late all the way to Chicago, being slowed first by a wreck of four berry cars, then in the mountains by the death



K-1034—Inverted Key Curb Stop with loose tee handle. Round way, inside iron pipe threads.



K-1420—Inverted Key Curb Stop with loose tee handle. Round way, for copper service pipe both ends.



K-1136 — Corporation Stop with hexagon on inlet. Iron pipe threads both ends same size. Plain bore.

It's well known among the trade that Glauber water line connections give longer years of smooth operating, trouble-free underground service. The thousands of first installations still giving satisfactory service prove it. Precision workmanship plus wide experience makes this possible. Plumbers and waterworks engineers bear it out. To insure a better job today, and better service tomorrow, specify Glauber Red Brass ground key work.

THE Glauber BRASS MFG. CO., KINSMAN, OHIO

Division of H. B. SALTER MFG. CO., Marysville, Ohio

of a woman passenger, and lastly by a broken drive rod on the engine.—Because the train was late we were able to see the entire Upper Canyon of the Colorado River and we passed through the Moffet Tunnel about noon. The curtain at the end of the tunnel closed to permit the gases to be blown out and we were on our way down the mountain through 26 short tunnels, as we wound in and out through the peaks and crags. The mountain stream dropped far faster than we did and was something to watch as it tumbled from rock to rock. But the sight of sights was the first glimpse as we rounded one peak and saw miles off in the distance the green plain west of Denver.

Other scenes remain in the memory—the Humboldt River, a thousand miles long from its beginning to where it disappears in the sands—Battle Mountain, where the famed Donner Party lost 26 of its members in a battle with Indians, and the graveyard (miles from the mountain) near the railroad and marked by a very small wooden cross. On the trip out our party saw the Donner Pass, where the Donner Party lost 26 more of its members in the storms.—(The number 26 came up two other times on this trip; the 26 short tunnels before Denver, and we crossed the Humboldt River 26 times.)

Our engine broke a drive rod as we came into Shafter, Nev., and the Lord or Lady Luck must have been with us, for there on the side track was a freight train with a pusher engine which was given to us to take us to Wendover (site of a famous bomber station). Boy! was it warm in those mechanically refrigerated cars while we waited for that engine changing job in Shafter—of course, we all gaped at the Bonneville Salt Flats—it's just incredible to see those miles of salt (96 per cent pure) stretching farther than the eye can see, and where Mr. Cobb was soon to make an assault on the automobile speed record.

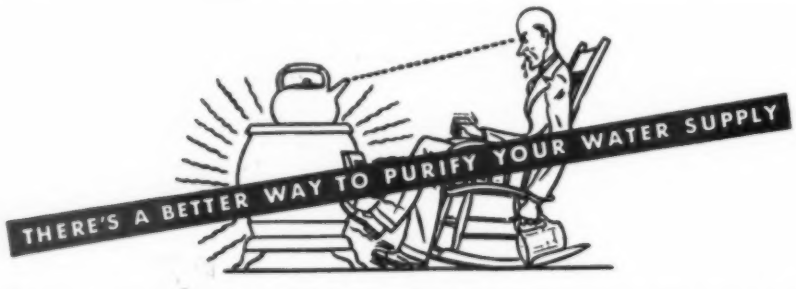
* * *

At Salt Lake City we began to disintegrate as a group, the Casey Jones's and Ted Rimback left us.—At Denver I think we lost a couple more and at Chicago several—and from there on now one, now two dropped off. Bill Sherwood was going the farthest (Boston).—Most of the crowd were in three special cars, but three of us, Paul Hedenstad, Supt. of Sewage at Worcester, Mass., Sam (Puzzle) Newkirk, and I were in the United Nations car.—We called it that because in addition to us three water and sewage works men, there were five Chinese (three spoke one dialect, two another), three English ladies, two Basque Frenchmen, an American soldier and two or three Army nurses returning from the Philippines, and two others whose tongue we could not place, but we could and did talk with the Hearfield's, a charming mother and daughter from E. Yorkshire, England.—It was interesting to hear just how pinched the food rations are there (and they've become worse since).

* * *

The prairies of Iowa and Illinois looked mighty green and good after Utah, Nevada and Colorado—it seemed like being home to this "Sucker."—As the hours dragged on and we felt more and more the need of a bath, and clean shirts began to run low, thoughts and expectations turned to home.

The three of us in our "United Nations" car had one break; it was hooked on the Broadway Limited at



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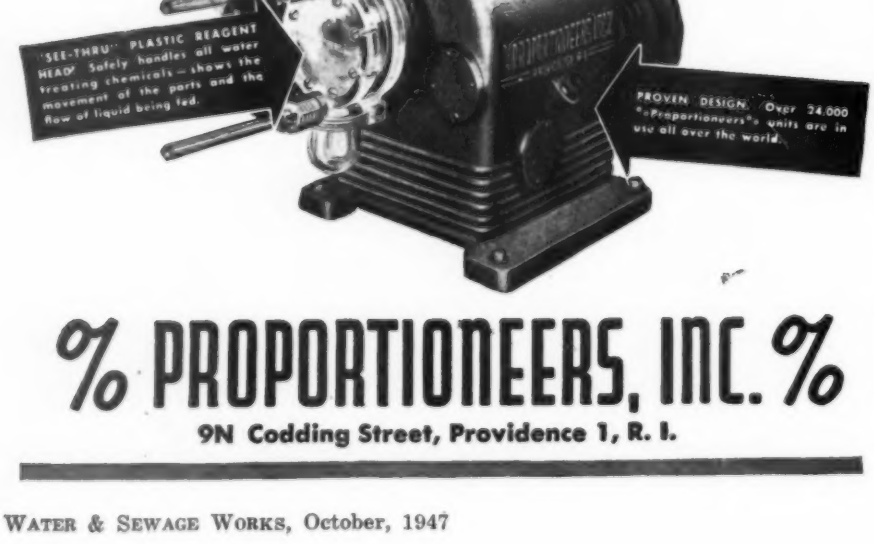
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CONTINUOUS FEEDING. Unique stroking arrangement gives long feeding stroke and short suction stroke — provides uniform distribution.
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Chicago and we beat the rest of the crowd back to New York.—It was great to be home, but I wouldn't have missed that trip for anything.—Thanks Mr. Gillette Publishing Co., for sending me.—V.T.Y., Doc.

[Overflow from the main section]

U. S. Sanitary Engineers Invited to Join New Inter-American Association

As a result of two Inter-American Regional Sanitary Engineering conferences held in 1946 at Rio de Janeiro, Brazil and Caracas, Venezuela, a new association of sanitary engineering has been formed. More than 400 sanitary engineers, public health and public works administrators, chemical and civil engineers, sanitarians and sanitary chemists from the twenty-one American Republics gathered at these two meetings sponsored jointly by the Ministries of Public Health and Public Works of Brazil and Venezuela, the Pan American Sanitary Bureau, and the Institute of Inter-American Affairs.

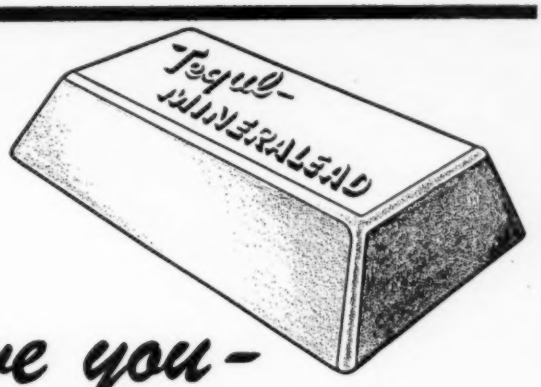
This Association, called "The Inter-American Association of Sanitary Engineering", is established exclusively for scientific and professional purposes and is a non-profit society. The principal objective is to reach, by common agreement, the solution of problems relating to sanitation and the establishment of standards for the uniform and continuous protection of the people of the hemisphere.

The Association now has in press the first of its quarterly journals which will contain the technical papers presented at the conferences, as well as news items and other articles of interest to persons interested in sanitary engineering. The Journal is to be printed in three languages—Spanish, Portuguese and English.

Sanitary Engineers and others engaged in allied sanitation activities are invited to become charter members of the Association before the next South American conference to be held in November, 1947.

Membership in this Association offers an opportunity to participate

This—



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BELL and SPIGOT JOINTS...

with super-resistance to Vibration, Mechanical Shock and Sudden Temperature Changes!

Because it delivers faster, easier and permanently tight joints, with saving in labor and subsequent maintenance costs, Tegul-MINERALEAD has won high preference among water works engineers.

The ingot form is handy, clean, easy to ship and store, impervious to moisture, so may be stored in the open without protection against rain, flood and snow. Its correct physical composition is never upset by jolting in transit. It melts and pours readily in summer or winter temperatures, needs no skilled labor, caulking or deep bell holes.

Tegul-MINERALEAD'S plastic sulphur base greatly reduces initial leakage and hastens self sealing. This in turn, permits prompt back filling and clearing up of traffic hazards arising from open trenches.

Tegul-MINERALEAD has a record of years of sound, economical performance in urban and long distance water lines—in all sorts of terrain and under extreme climatic conditions.

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*SALT LAKE CITY 11, Utah, 925 S. 6th West St.
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in the development of lasting understanding between the Americas through the common problem of protecting the health of the people by an exchange of ideas and the association with individuals having problems and objectives similar to those in the U. S. Charter membership is now available, without initiation fee, by payment of only the annual dues of $3. Further information may be obtained from Homer J. Hayward, U. S. Representative of the Membership Committee, Inter-American Association of Sanitary Engineering, Pan-American Bldg., Washington, D. C.

New England Sew. Wks. Assn. Fall Meeting at New London, Conn.

The New England Sewage Works Assn. held its fall meeting at New London, Conn. More than 116 members and guests attended the luncheon held at Ocean Beach Park. They were welcomed by Mayor N. Benvenuti who some years ago was the contractor who built the New London Sewage Treatment Plant. At the luncheon the principal speaker was Mr. Ken Taylor, Sanitary Engineer of the Massachusetts Dept. of Health, who spoke on "A Sanitarian in Insanitary Japan." Mr. Taylor gave an excellent view and description of the conditions in Japan and the attitude of the populace.

Business Meeting

At the annual business meeting the following persons were elected to serve as officers for the following year:

President, LeRoy W. Van Kleeck, Sanitary Engineer, State Dept. of Health, Hartford, Conn.

Vice President, Walter H. Brown, Jr., Operator, Sewage Treatment Plant, Cranston, R. I.

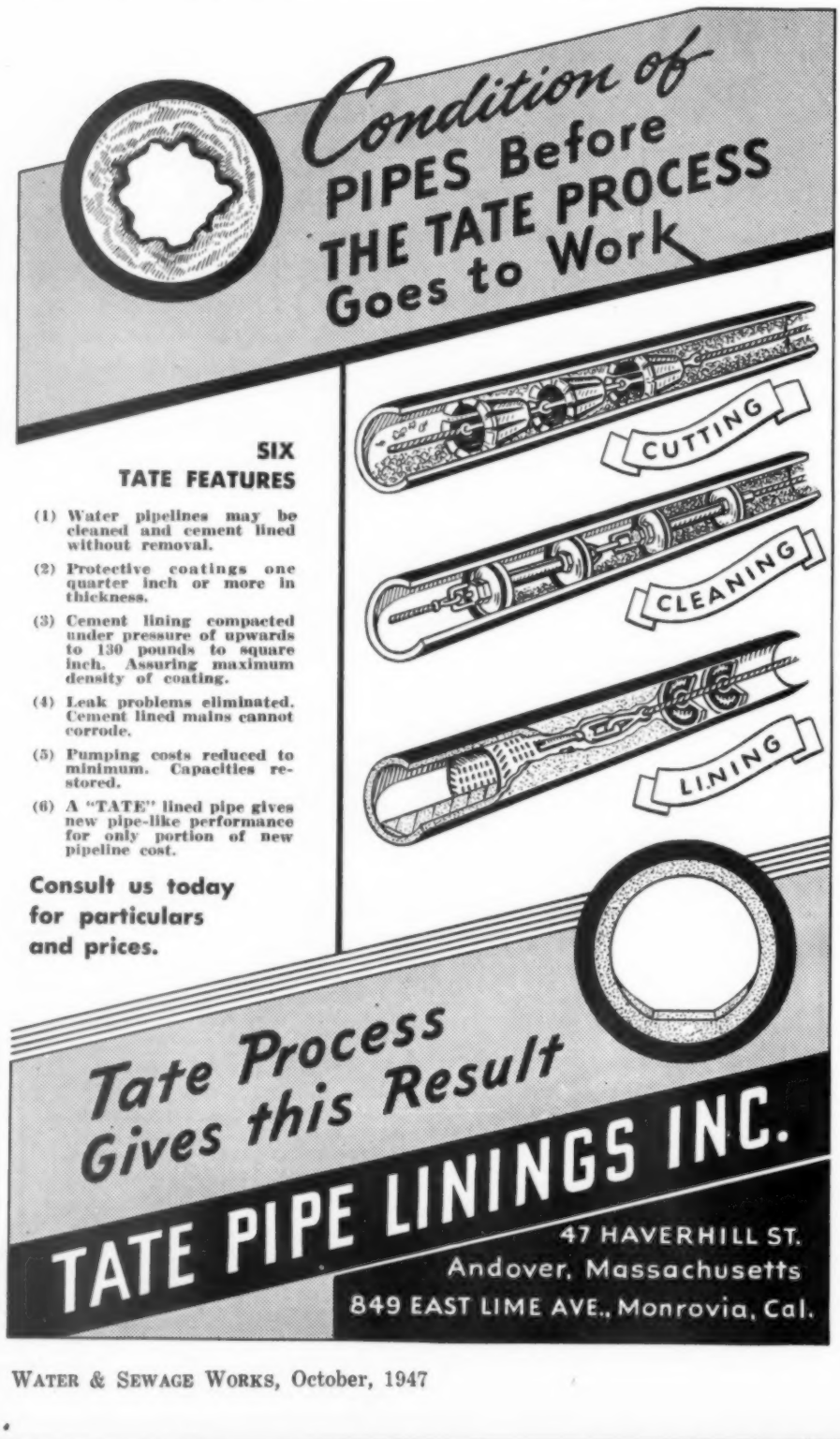
Secy.-Treas., Walter E. Merrill, Sanitary Engineer, State Dept. of Health, Boston, Mass.

At the business session, the outgoing president, Thomas M. Camp, Consulting Engineer of Boston, made the Federation of Sewage Works Associations' Kenneth Allen Award for the New England Association to Stuart Coburn. Mr. Coburn was not at San Francisco to receive the award at the National Convention and so the award was made in New London.

Mr. Camp also presided over the technical session which included a paper on the Boston Metropolitan Sewer District by Thomas A. Berrigan, Chief Engineer of the District. Mr. Berrigan explained how it was necessary for engineers and operators to live with what they have. Oftentimes conditions which are unforeseen during design develop later and from these conditions and the problems of operation comes the design of new works. At the present time the Boston Metropolitan Sewer District is in a period of transition from the old sewers to new designs. They have a regular schedule of priorities of which financing is one of the earliest.

W. S. Wise, Chief Engineer, Conn. State Water Commission, Hartford, Conn., spoke on industrial wastes with particular emphasis on the economic factors concerned with handling these wastes. Mr. Wise pointed out the rapid changes which had taken place in industrial processes and the effects of these rapid changes on wastes and waste treatment. Industrial wastes are not a stable commodity such as sewage. Mr. Wise discussed some of the details of different types of plants for different types of industries including paper, textiles, metal, etc.

Norman S. Holroyd of the firm Keis & Holroyd, designers of the New London, Conn. plant, described the plant in its detail and later, with Mr. Walter Capwell, Superintendent,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TATE FEATURES
(1) Water pipelines may be cleaned and cement lined without removal.
(2) Protective coatings one quarter inch or more in thickness.
(3) Cement lining compacted under pressure of upwards to 130 pounds to square inch. Assuring maximum density of coating.
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(6) A "TATE" lined pipe gives new pipe-like performance for only portion of new pipeline cost.
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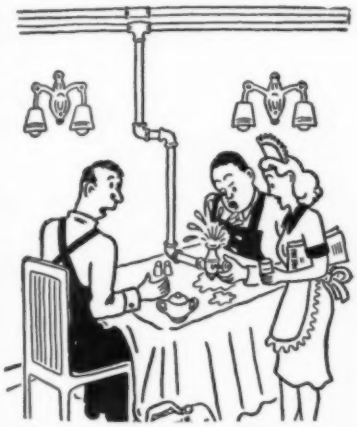
conducted a tour of the plant. The sewage treatment plant and refuse incinerator were designed and built together. The sewage plant with a 6.4 mgd. flow is designed for a 40,000 population, and the incinerator for 120 tons per day. Sedimentation, chlorination, and sludge digestion are practiced; the sludge is dewatered on vacuum filters and then taken to the incinerators or used for fertilizer.

One Solution!



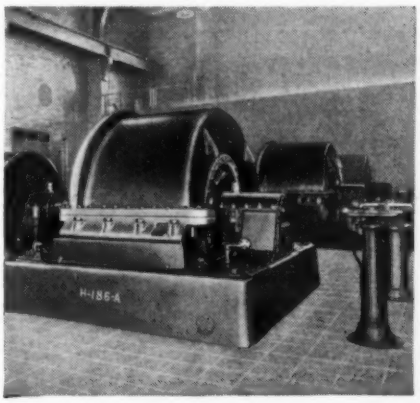
Those boys from the Waterworks Shop hit on a solution to the problem of the waitress who just won't bring the water until the third request.

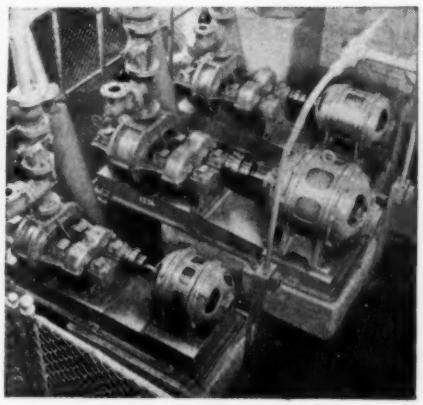
Pointers on the Selection of Valves

It is not always as easy to select the right valve for a given purpose as might be supposed. Why? Because there are so many different types of valves: gate, globe, cross, plug, butterfly, reducing, stop, angle, needle, diaphragm, and so on, almost endlessly. Therefore, the valve, first of all, must be of the right type and suitable for the liquid or gas to be handled.

Modern valves are made of many metals and other materials, including forged steel, cast steel, malleable iron, cast iron, ferro-steel, brass, brass alloys, fibre, lead, monel metal, nickel, stainless steel and today even of plastic materials. Whatever the material that may be deemed best for the purpose, there is always a possibility that it can be used for the making of a valve to resist the gas or liquid to be handled.

Where water is to be handled, its acidity should always be given consideration. In large and long pipe lines carrying steam, strong and tough valves are essential because of the expansion and contraction strains that result, possibility of water hammer, stresses caused by the weight





The wide use of Roots-Connersville Blowers, in sewage plants and waterworks, provides "expert evidence" of the satisfaction they deliver. Whether small units or large ones, engineers are enthusiastic about the reliable, economical performance of R-C equipment.

They like, especially, the unbiased recommendations which come from our *dual-ability* to supply either Centrifugal or Rotary Positive equipment. They tell us that this independent thinking goes far toward making the blowers exactly fit the specific job to be done.

So—for new plants, expansion or replacement, consult R-C *dual-ability*. Send for our new bulletin No. 23-120-B10 showing many blower applications. It will prove that you can enjoy the long years of satisfaction resulting from our blend of advanced engineering and a half century of blower-building experience.

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BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS
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of the pipe itself, probably misalignment during the process of erection, and the possibility of settling after erection.

Also, if steam is to be handled investigate the possibility of cutting effect by the steam on the valve disc and seat as the steam passes through. This cutting effect is particularly noticeable in certain types of reducing valves in which the disc is held close to the seat. The reducing valve that operates wide open most of the time is invariably more durable than those that are nearly closed most of the time.

To find the limiting water pressure of a valve, multiply the limiting steam pressure by 1.4 for 12-inch sizes or smaller than 12 inches. For 14-inch sizes or larger than 14 inches multiply by 1.2.

Contributed by W. F. Schaphorst, M.E., Newark, N. J.

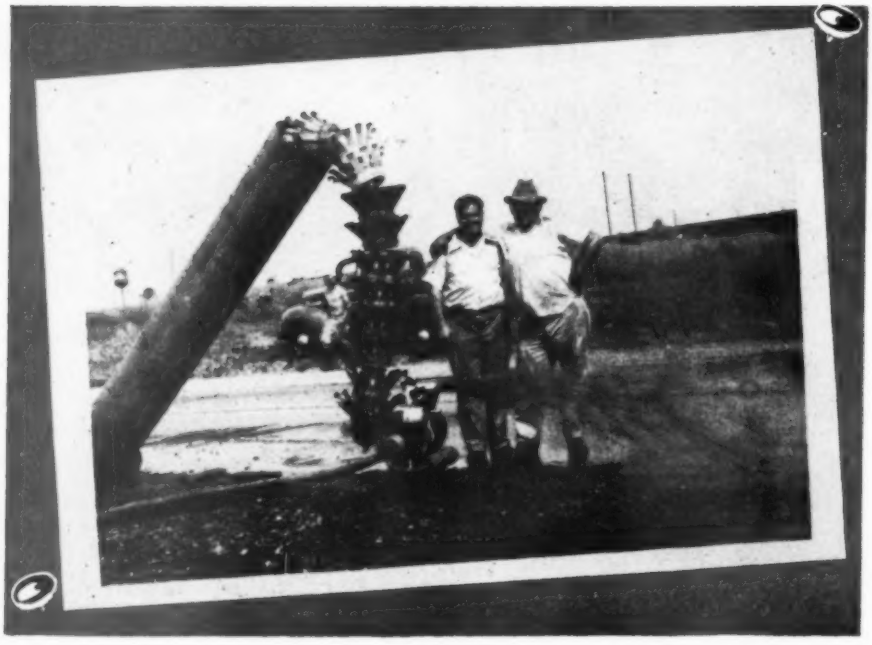
Westchester Water Works Conference Outing

One hundred sixty-six water works officials and their guests from the county of Westchester, N. Y., attended the seventh annual meeting and outing of the Westchester Water Works Conference held at Schmidt's Farm, Greenburgh, N. Y., on July 17.

An afternoon of outdoor sports was followed by a dinner and brief business meeting presided over by James C. Harding, Chairman, and Public Works Commissioner of Westchester County.

New officers designated to take office January 1, 1948, were A. E. Kassay, Chairman, Supt. of the Board of Water and Sewer Commissioners of North Tarrytown, and the following directors: James C. Harding; William Foster, Supt. of the Water Dept., Peekskill; Walter G. Close, Port Chester Water Works, Port Chester; and R. M. McLaughlin, Secy. and Treas.

. . . another "SNAP"—



FOR "FLEXIBLE" TOOLS AND EXPERIENCE

Actual snap-shot shows 12" "Flexible" pressure line scraper at the end of its run. Sizes of pipe cleaned included 6", 8", 12", 16" and 20" lines.

Another "snap" for the Album of "Flexible" Tools and Experience shows this run in the 12" water main on Jersey Avenue, New Brunswick, N. J. Work was carried through to completion in fast time, at low cost and with a minimum of inconvenience to water users. As in most "Flexible" operations, this New Brunswick job was taken on a 100 per cent contract basis. Depending, however, upon customer option, "Flexible" also contracts tools and supervision, rents tools, or makes outright tool sales for all line cleaning requirements.

YOUR pipe cleaning needs are important. It will pay you to check "Flexible" today on any basis — equipment, methods, cost.

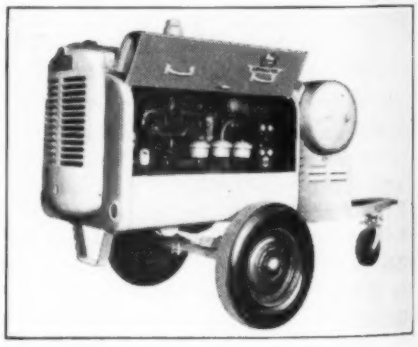
FLEXIBLE UNDERGROUND PIPE CLEANING CO.
9059 Venice Blvd., Los Angeles, California

855 Board of Trade Bldg. Chicago 4, Ill.
401 Broadway New York 13
147 Hillside Ter. Irvington, N. J.
P. O. Box 165 Atlanta
41 Greenway St. Hamden, Conn.
1624 Harmon Place Minneapolis 3, Minn.
29 Cerdan Ave. Roslindale 31, Mass.
P. O. Box 694 Pittsburgh
P. O. Box 447 Lancaster, Texas

MANUFACTURERS' and EQUIPMENT NEWS

Le Roi Airmaster on Wheel Mounting

LeRoi Company's newest compressor is the "85" Airmaster powered by the Le Roi Model D201 valve-in-head engine with replaceable cylinder sleeves, precision bearings, pressure lubrication and magneto ignition. The compressor, built integrally into the engine block, is liquid cooled and is regulated by the LeRoi patented econotrol, controlling compressor operation automatically according to the demand for air.



The "85" is offered in a choice of two mountings, the popular type E shown here and also on hardwood skids type A. Full length tool boxes

are standard with either type mounting. Descriptive literature and general specifications are available and will be forwarded upon request to LeRoi Co., 1706 South 68th Street, Milwaukee 14, Wis.

L. A. Weom to Head Fairbanks-Morse Pump Div.

Announcement has been made of the appointment of L. A. Weom to the position of Manager of the Pump Division of Fairbanks-Morse. Mr. Weom, who replaces Arnold Brown, retired, has been with the company since 1929, starting in the Pump and Electrical Department of the company's St. Paul, Minn., branch.

Buxton Heads A.I.S.I. Comm. On Steel Pipe Research

E. A. Buxton has been elected Chairman of the Committee on Steel Pipe Research of the American Iron and Steel Institute. He succeeds E.

P. Corey, who served as chairman of the committee from its inception in 1942. Mr. Buxton is Sales Manager for pipe and tubes for the Bethlehem Steel Co.

The Committee on Steel Pipe Research of the American Iron and Steel Institute was established in 1942 to handle exclusively matters concerning steel pipe. Sound technical and factual data and practical information prepared by the committee are of value to users of pipe, architects, engineers, and salesmen. In addition to the research by individual pipe manufacturers, which will be continued, there are many phases which can be handled appropriately by the steel pipe industry as a whole.

Included in the committee's collection and correlation of technical and commercial data, there has been an assembling of extensive information on water supplies, which has been published in booklet form.

The committee is at present studying the trend and use of corrective water treatment for corrosion and scale prevention; the effectiveness of new chemicals that are advanced for that purpose; the value of temperature control; methods of cathodic protection; new and improved coatings; and new designs of pipe joints and fittings. It seeks, also, to help develop uniform plumbing, heating and sanitary codes at the national, state, and local levels.

Chain Belt Field Changes

Chain Belt Co. of Milwaukee announces a change in its field force personnel. Mr. Charles Stanton has moved from the Detroit office to the Philadelphia office. Mr. Stanton had taken the training course at the Chain Belt and Baldwin-Duckworth factories.

In the course of cleaning close to forty million feet of pipe over a period of more than forty years, the National Water Main Cleaning Co. had developed highly specialized methods and equipment for removing practically any type of pipe accumulation or obstruction quickly, economically and thoroughly.

National Know How Pays.

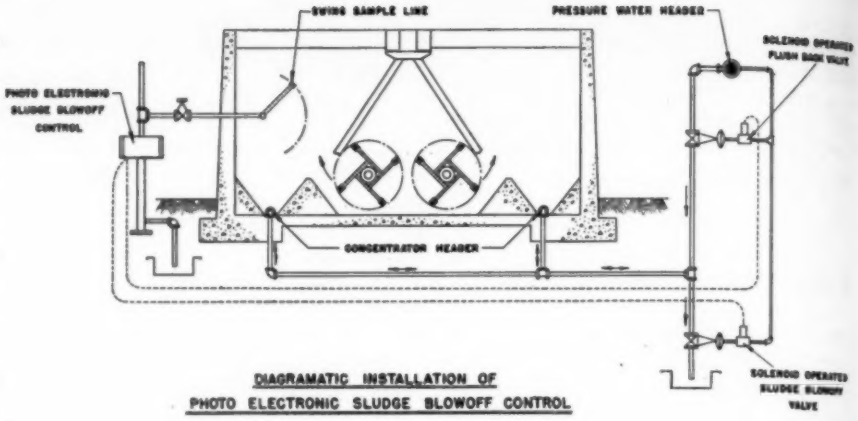
NATIONAL WATER MAIN CLEANING COMPANY
50 CHURCH STREET, NEW YORK 7, N. Y.

ATLANTA.....1221 Mortgage Guarantee Building
BOSTON.....115 Peterboro Street
CHICAGO.....205 West Wacker Drive
HOUSTON.....2518 Grant Street
KANSAS CITY.....421 B.M.A. Building
LOS ANGELES.....448 South Hill Street
MEMPHIS.....822 Dermon Building
OMAHA.....3812 Castellar Street
RICHMOND.....210 East Franklin Street
ST. LOUIS.....7103 Dale Avenue
SALT LAKE CITY....149-151 W. Second South Street
SAN FRANCISCO.....681 Market Street
MONTREAL.....2028 Union Avenue
WACO.....P. O. Box 887
WINNIPEG.....576 Wall Street
HAVANA • MAYAGUEZ, PUERTO RICO • BOGOTA • CARACAS • MEXICO CITY

Photo Electronic Sludge Blowoff Control

The accompanying diagram shows the new photo-electronic sludge blowoff control as developed by The Permutit Co. of New York City. By means of samples collected from the swing sampling line taken through a photo electronic control, which operates on the light extinction principle depending on the turbidity caused by the sludge or floc, it is possible to operate sludge valves for the removal of concentrated sludge at the bottom of the tank.

Further information on this blow-off control is available.



DIAGRAMATIC INSTALLATION OF PHOTO ELECTRONIC SLUDGE BLOWOFF CONTROL

WITH ACCELO* FILTER SYSTEM

Mass action of active aerobes on organic matter in sewage is provided by the ACCELO FILTER system, which returns directly to the filter large quantities of the unsettled trickling filter effluent teeming with active aerobic bacteria, thus increasing to myriads the number of active aerobes in the filter.

It is the UNSETTLED trickling filter effluent returned DIRECTLY to the filter that provides Mass Action of active aerobes. The aerobic bacteria in the unsettled effluent have been well supplied with oxygen and are in their most active state. Their span of life is from 3 to 5 minutes, and within that time they divide and multiply. To take advantage of this tremendous activity, the Accelo Filter system returns the unsettled effluent directly to the filter.

Write for authentic operation reports of Accelo Filter plants for proof of improved treatment results. INFILCO Inc., 325 West 25th Place, Chicago 16, Illinois.

Trade-Mark Reg. U. S. Pat. Off.

IF YOU WANT TO KNOW — ASK INFILCO

Time Totalizer

Manufactured by the R. W. Cramer Co., Inc., Centerbrook, Conn., a new Time Totalizer or Running Time Meter features a counter that can be reset to zero. Designed for use on AC circuits, the meter automatically registers total operating or idle time of any circuit, machine or system to which connected.

Typical applications include use to indicate total operation hours of automatic pumps and machines, forecasting need of servicing and parts replacement. Also used to check operating hours of equipment or material to be tested in laboratories, etc.

Precision-built five digit revolution type counter made of especially developed metals has demonstrated resistance to wear. It indicates in tenths up to 10,000 hours, then repeats. Running Time Meters with reset features are available in three models.

For complete data, write R. W. Cramer Co., Centerbrook, Conn.

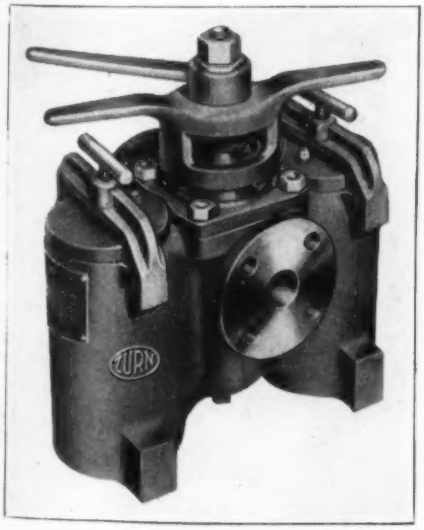
Engine Drive Pipe Cleaning Machine

Shown herewith is the new Stewart Engine Drive Pipe Cleaning Machine. This Stewart single unit machine, double drum, engine drive does all the work over one manhole.

The double drum machine pulls the bucket back into the sewer, then forward, around the guide and up to the street. The double drum hoist is mounted on a Torsion Spring Suspension Trailer equipped with 600x 16 pnuematic tires and the cable drums will hold 900 ft. of ½-in. cable or 1800 ft. of ⅜-in. cable. Further information may be obtained from W. H. Stewart, Inc., P. O. Box 767, Syracuse, N. Y.

Twin Sediment Strainer

A new type duplex or twin Sediment Strainer has been developed by the J. A. Zurn Mfg. Co., Erie, Pa. This product was designed to meet the demand for an economical strainer in pipe lines where continuous flow is imperative. When the strainer is to be cleaned, flow can be diverted from one basket to the other without interrupting passage through the strainer. The unit operates by means of a single plug type valve whose orifice will direct flow from the inlet to either basket, or both simultaneously.



For further information write the J. A. Zurn Mfg. Co., Erie, Pa.

Link Belt Changes

Al Musschoot Asst. Chief Engr.

Among the recent changes and elevations of personnel at Link Belt recently was the appointment of Albert Musschoot as Asst. to the Chief Engineer in the Chicago offices of the company. A graduate of M.I.T. in 1936 Musschoot has been a member of the general engineering staff of the company at Philadelphia.

Other changes of personnel include the appointment of James B. Elliot, heretofore divisional manager for the Caldwell plant, as divisional sales manager at the Minneapolis, Minn. plant. Mr. Erwin A. Wendell formerly of the Chicago Branch is now div. sales mgr. for the Caldwell plant products. T. W. Matchett, formerly of the New York office, is now district sales manager of the Chicago branch.

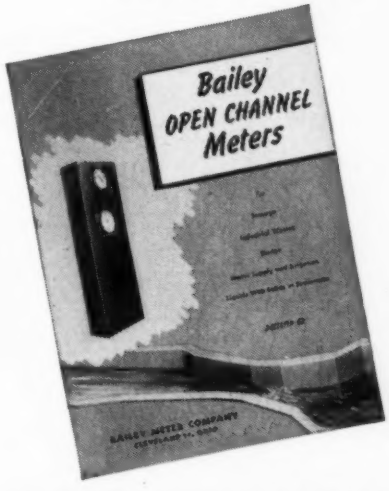
For trouble-free, low cost measurement of—

SEWAGE
INDUSTRIAL WASTES
SLUDGE
IRRIGATION WATER •

BAILEY

OPEN CHANNEL METERS

Offer These Advantages:



1. Easy to Install
2. Retain Accuracy
3. Self-Cleaning
4. Adjustable Capacities
5. Totalize Multiple Flows
6. Chemical Feed Control
7. Flow and Ratio Controls

Ask for Bulletin 62

MU22

BAILEY METER COMPANY

1072 IVANHOE ROAD • CLEVELAND 10, OHIO

METERS and CONTROLS for SEWAGE and WATER

VENTURI TUBES, FLUMES, WEIRS, NOZZLES, ORIFICES • DIRECT MECHANICAL AND REMOTELY LOCATED REGISTERS • AIR-OPERATED, ELECTRONIC AND ELECTRIC CONTROLS.

Plastic Pipe and Fittings Available

The American Hard Rubber Co. of 11 Mercer St., New York 13, N. Y. has announced that polyethylene pipe and fittings will soon be available. These new Ace products in sizes from ½-in. to 2-in. are insoluble in all common solvents at temperatures up to 60 deg. C. with the exception of chlorinated solvents and aliphatic and aromatic hydrocarbons at elevated temperatures. These new plastic pipes and fittings are applicable in chemical handling lines, water and chemical connections, coolant lines, and conduits. Pressures up to 50 lb./sq. in. may be withstood and in some cases pressures as high as 100 to 150 lb./sq. in. may be withstood. Further information on this new plastic pipe and fittings may be had on request.

Enterprise Acquires Hendy Diesels

The Enterprise Engine and Foundry Co. of San Francisco, Cal., has acquired the complete line of Hendy marine and stationary Diesel engines formerly manufactured by the Joshua Hendy Iron Works of Sunnyvale, Cal.

The company announces that there will be no interruption in continuity of sales, manufacturing, or servicing of the Hendy engines. Present owners of Hendy engines are assured that there will be a continued availability of parts and service for all models of the Hendy line.

Ferguson Becomes Manufacturers' Agent

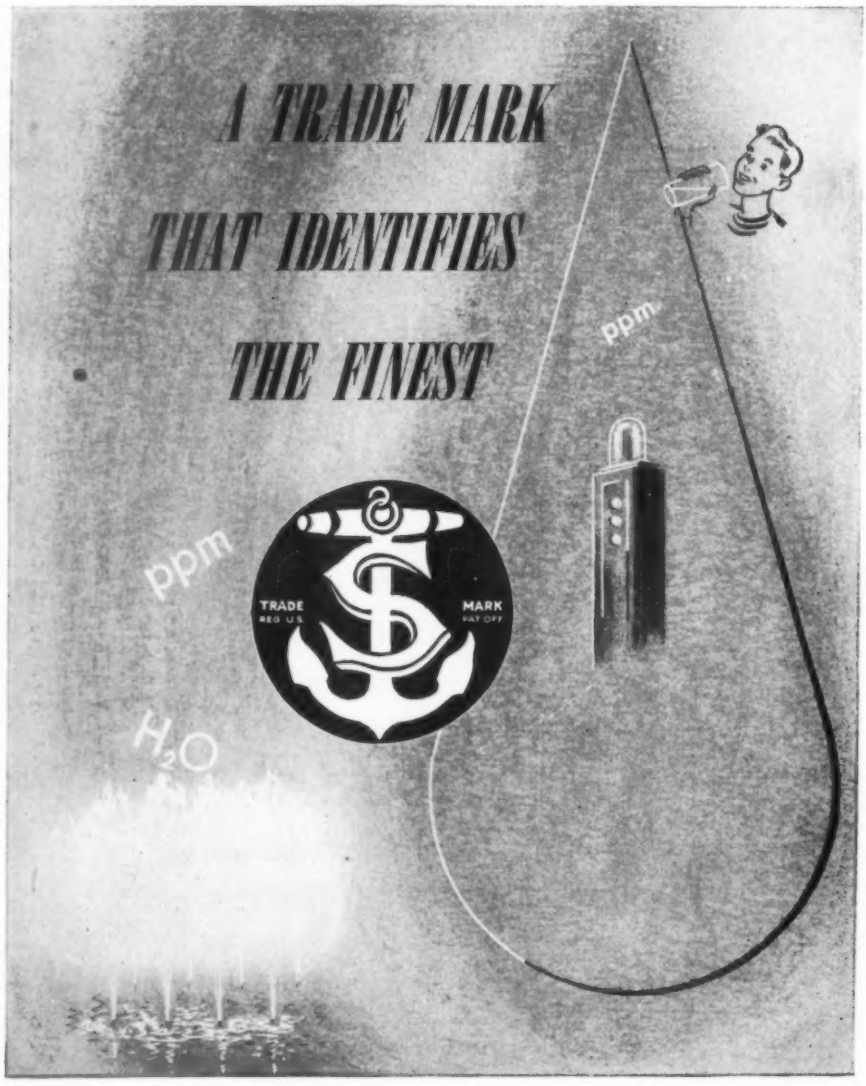
R. E. (Bob) Ferguson, long time associated with The Hersey Meter Co., has gone in business for himself as a manufacturers' agent in New England. With a background of

thirty years of practical experience and a wide acquaintance in the water works field, Mr. Ferguson now acts as special representative of the Worthington-Gamon Meter Co. in Maine, New Hampshire and Vermont. Mr. Ferguson also will represent %Proportioneers, Inc.%, and other firms.

Self Priming Centrifugal Pump

A self-priming centrifugal pump for drainage work, manufactured by Jaeger Machine Co. of Columbus, Ohio, uses overall housings which

protect the engine as well as the pump from weather and dirt. Keeping water from sparkplugs, carburetor and crankcase insures quick starting and more efficient operation and adds to engine life. Side panels give instant access to all



SOLVAY PRODUCTS FOR WATER CONDITIONING

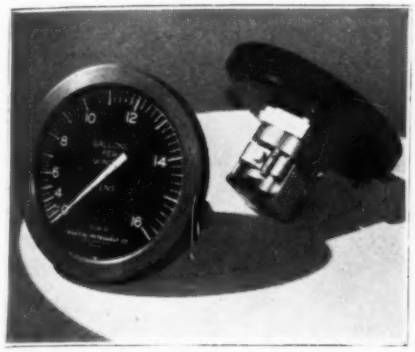
Soda Ash Liquid Chlorine

SOLVAY SALES CORPORATION *Alkalies and Chemical Products Manufactured by The Solvay Process Company*
40 RECTOR STREET • NEW YORK 6, N. Y.

operating controls. Enclosures on small pumps also lift off when necessary. On larger pumps the big housings give easier access to engine parts and the entire pump end is hinged to swing completely open.

Fast and doubly-sure priming is accomplished by combining "inherent" priming action with "jet" priming—two independent actions which operate simultaneously. Catalog P-45 describing the complete line is available on request.

New Differential Pressure Indicator



The Barton Instrument Co., of 1844 Hyperion Ave., Los Angeles 27, Calif., has announced a new Model 181 Differential Pressure Indicator for the accurate measurement of flow, liquid level and pressure differentials. The Model 181 features a six inch dial for easier visibility; wide differential pressure range (0-50 inches of water up to 0-200 psi.); universal mounting and an improved vapor-proof case. The size of the indicator is 7½ in. diameter, depth 4½ in.

Write for bulletin 181-1.

New De Laval Los Angeles Dist. Mgr.

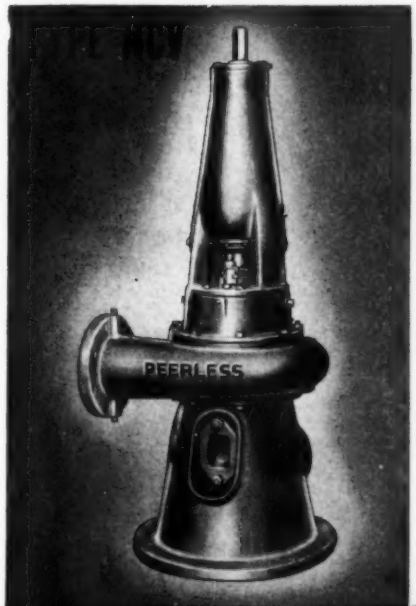
Harvey A. Mylander has been appointed District Manager for Southern California and Arizona for the De Laval Steam Turbine Co. of Trenton, N. J. Mr. Mylander, who will have his offices at 124 West Fourth St., Los Angeles, Calif., is a graduate of the University of Arizona and was formerly associated with the General Electric Co. and the American Hoist and Derrick Co.

American-Standard Announces New Baseboard Radiant Panels

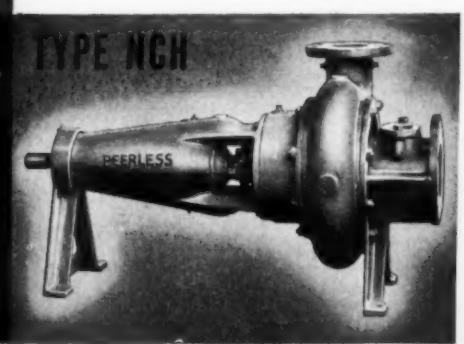
Latest development to be announced by American-Standard in the field of radiant heating is the new Baseboard Radiant Panel, soon to be available for shipment.

American Baseboard Radiant Panels will be produced in two models, a radiant panel, Type "R," and Radiant-Convector panel, Type "RC." These panels are 8 in. high, 2 in. thick, and are made in two lengths, 12 and 24 in. The Baseboard Radiant Panel fits snugly against the wall when installed, or it can be partially recessed, saving additional floor space. These new Baseboard Radiant Panels can be installed along one or more sides of a room, in place of the wood baseboard.

These Baseboard Radiant Panels are manufactured by American Radiator & Standard Sanitary Corp., P. O. Box 1226, Pittsburgh 30, Pa.



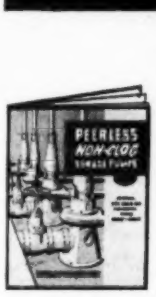
PEERLESS NON-CLOG SEWAGE PUMPS
VERTICAL DRY BASIN AND HORIZONTAL TYPES



NON-CLOG IN ACTION AS WELL AS IN NAME

Wherever the improved Peerless Non-Clog Pump is installed, it lives up to its name by offering positive *non-clog* pumping action. All wearing rings, end plates, filler rings, etc., have been discarded in the Peerless design, in favor of an improved impeller with unique repelling vanes on both of its outer shrouds. These repelling vanes provide a pumping action similar to the working vanes between the shrouds, preventing accumulation of solids in the space between the impeller and casing side walls by agitating the solids into the center flow of the fluid stream. Specify Peerless Non-Clog Sewage Pumps for trouble-free service and economy in sewage treatment and relift stations.

Left: NCV Vertical Type. Non-clog, single-stage, single suction, ball bearing type, for dry basin installation. Below: NCH Horizontal type. Capacities: 100 to 7000 g.p.m.; heads up to 70 feet.

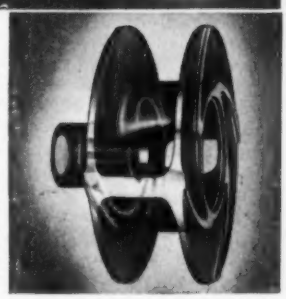


The Impeller is The Heart of Any Pump.

These improved sewage pumps utilize a two port impeller with unique repelling vanes on outer shrouds. Scientifically designed working vanes of uniform thickness develop positive pumping action.

Peerless' constant experimentation and unique impeller design has resulted in a dependable means of pumping entrained solids.

REQUEST BULLETIN ★ All Peerless improvements and advantages in non-clog sewage pump design are described in this new bulletin. Write for No. B-154.



PEERLESS PUMP DIVISION

Food Machinery Corporation

FACTORIES: Los Angeles 31, Calif.; Quincy, Ill.; Indianapolis, Ind.
District Offices: Chicago 40, 4554 North Broadway • Philadelphia Office: Suburban Square, Ardmore, Pa.
Atlanta Office: Rutland Building, Decatur, Georgia; Dallas 1, Texas; Los Angeles 31, California

PAYNE DEAN GATE OPERATOR

NEW! NEW!

SOMETHING NEW FOR QUICK OPERATION OF GATES TO 30 IN. A PORTABLE GAS ENGINE DRIVEN GATE OPERATOR-UNLOAD IT AT THE JOB AND LET THE TRUCK GO ABOUT ITS REGULAR BUSINESS. ONE MAN CAN HANDLE THE LITTLE FELLOW. 6 H.P. MOTOR. HUSKY, STRONG (450 LBS.) BIG TIRES AND BALL BEARING WHEELS FOR ROUGH GROUND. SAFETY SHEAR COUPLING-REVOLUTION COUNTER AND REVERSE GEAR. SPEED RANGE 15 TO 30 TURNS A MINUTE.

PAYNE DEAN & CO., MADISON, CONN.

For

BALANCED PUMP OPERATION
Specify

SELECTROL

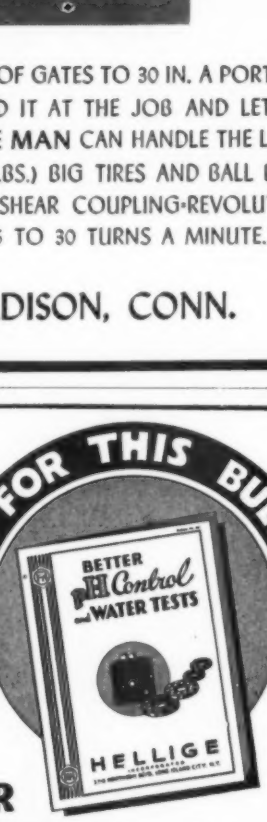
SELECTROL closely balances total pump capacity with rate of inflow at each operating level, for either rising or falling level cycle. It handles up to 18 circuits singly or in combination for any float travel up to 40 feet. A large number of circuits can be handled on limited float travel. A feature of SELECTROL is the "Lost Motion Clutch" which balances pumps of unequal capacity without "hunting". AUTOMATIC can help you with your multiple circuit problems.

Write for Bulletin S-7.

AUTOMATIC CONTROL Company

1013 University Ave., St. Paul 4, Minn.

WRITE FOR THIS BULLETIN



FOR

pH Control and WATER TESTS

A study of our 28-page Bulletin No. 602, containing the complete line of Hellige apparatus for pH control and water analysis, will enable you to form an intelligent opinion as to what is best suited for extending your present equipment or for an initial installation.

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.

HEADQUARTERS FOR COLORIMETRIC APPARATUS

Gardner-Denver Sells Governor Business

In the interest of centering manufacturing facilities on its principal lines, Gardner-Denver Company has sold its Governor business to the Wiebmer Machine Shop of Quincy, Ill., Gardner-Denver officials recently announced. Gardner-Denver will henceforth concentrate on its expanding business in rock drills, air compressors, pumps and other allied products.

Slide Rule Simplifies Flow Rate Calculations

Foxboro Co. of Foxboro, Mass. has devised a specially designed 12-in. slide rule for computing orifice plate bores, flow nozzles or Venturi throats, and also the rate of flow or the differential created across the orifice plate or other primary measuring devices.

It can be used for all fluids, with or without seals, and covers such a wide range of flows and line sizes that it will handle almost any commercial problem. Costing $25 the slide rule can be operated by anyone familiar with slide rule operation and can solve in two minutes a problem that would require 20 to 45 minutes using tables, curves, and charts. Further information or the slide rules themselves may be obtained from the company as long as the limited supply lasts.

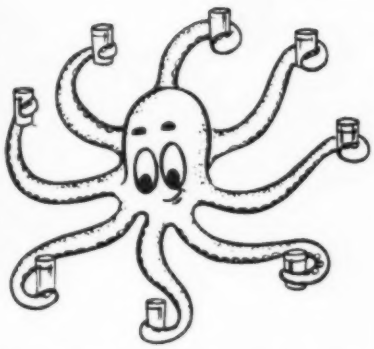
Corrosion Resistant Diaphragm Valves

The diaphragm type valve known as the Hills-McCanna Saunders Patent valve is now available from The Duriron Co., Inc., of Dayton 1, Ohio, in the corrosion resisting alloys, Duriron and Durichlor.

These valves can be used in a wide range of corrosive solutions including ferric chloride, aluminum chloride, filter alum, etc.

Complete information is available in Bulletin 623.

FOR
ACCURATE FEEDING
IT'S A NATURAL!

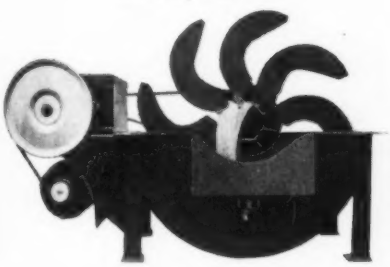


OMEGA
ROTODIP FEEDER

The eight-armed OMEGA Rotodip provides unvarying accuracy for feeding all water treating chemicals in solution. Its continuous gravity feed, regardless of changes in liquid level, maintains metering accuracy within 1%.

OMEGA'S infinitely variable speed drive provides positive adjustment of feeding rate over a 100 to 1 range. Its simple, unique design without valves, pumps or diaphragms makes the Rotodip ideal for feeding liquid alum, ferric chloride, acids, etc. Standard unit, capacity up to 800 g.p.h., can be furnished with automatic proportioning control. Also available in multiple units.

Write for Bulletin.



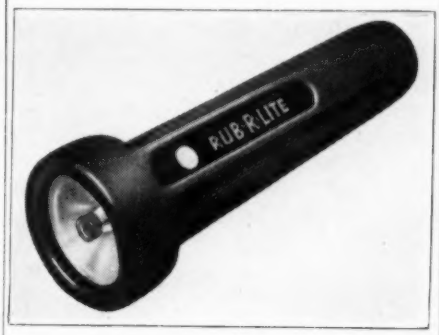
OMEGA PRODUCTS
Volumetric Feeders • Gravimetric Feeders
Solution Feeders • Lime Slaking Equipment
Bucket Elevators • Laboratory Stirrers

OMEGA MACHINE CO.
(Division of Builders Iron Foundry)
10 CODDING ST., PROVIDENCE 1, R. I.

OMEGA

New Flashlight

Manufactured by Lennan Lights, Inc., Burbank, Calif., and approved by Underwriters' Laboratories, Inc. for Class 1, Group D, Hazardous Locations, this new patented Rub-R-Lite "K2" Flashlight operates on a



new principle. All working parts (including approved bulb-ejector mechanism) are contained in a small "sealed - in - the - head" unit, which is "popped" in or out of the steel-lined Neoprene case, whenever bulb or batteries are to be changed. Rub-R-Lite "K2" introduces a specially designed long life one-button switch.

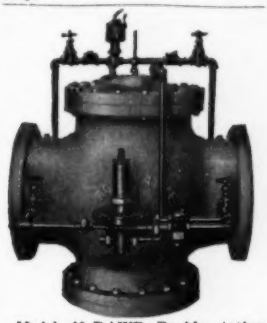
The pre-focused "head unit" and batteries become sealed inside the Neoprene rubber case, which gives longer life to batteries. Dropping or throwing the flashlight will not damage it. Submerging it in water or oil cannot hurt it.

Two-Pole Squirrel-Cage Induction Motor

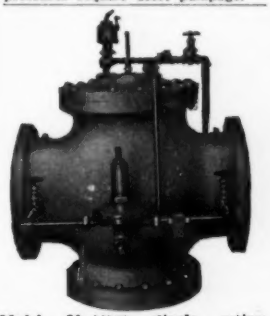
A newly announced two-pole squirrel-cage induction motor is an addition to the heavy duty line of the Electric Machinery Mfg. Co., Minneapolis 13, Minn. This new motor is designed for such high-speed applications as boiler feed pumps, oil line pumps, centrifugal pumps, compressors, and blowers. It is rated at from 200 to 700 hp. at 3600 rpm.

Est. 1879
ROSS
AUTOMATIC VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require diect pumpage.



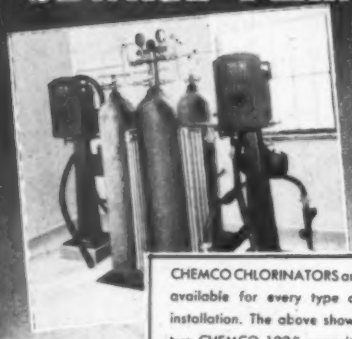
Model 30-AWR Single acting valve may be contolled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

CHEMCO
Equipment
FOR
EVERY CHLORINATION
AND
WATER CONDITIONING
PROBLEM

For Your
SEWAGE PLANT

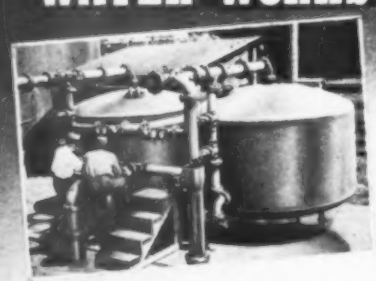


CHEMCO CHLORINATORS are available for every type of installation. The above shows two CHEMCO 100# capacity chlorinator installed for the State of New York. Note use of Aqua-Thermal Coils.

For Your
SWIMMING
POOL

CHEMCO has "Everything for the Swimming Pool" from the Filters to the Life Preservers.

For Your
WATER WORKS



A large Chemco Filter Plant installation for the Santa Fe Railroad, Winslow, Arizona. Consult CHEMCO first for your Chlorinator or Water Conditioning Problem.

CHEMICAL EQUIPMENT CO.
1700 NO. MAIN STREET
P. O. Box 3098 Terminal Annex
Los Angeles 54, Calif.
MIDWEST FACTORY BRANCH
211 W. Wacker Drive Chicago 6, Ill.
AGENTS IN PRINCIPAL CITIES

Blount to Represent Universal Concrete Pipe

Paul C. Blount of Zanesville, Ohio, has been appointed sales representative in the Zanesville area for the Universal Concrete Pipe Co.

Blount formerly was associated with the American Rolling Mill Company for five years and was the ARMCO sales representative for drainage products in southeastern Ohio for the last two years. Prior to that, he was sales engineer with the National Lime and Stone Co. of Findlay, Ohio, and the Standard Slag Co. of Steubenville, Ohio.

LITERATURE AND CATALOGS

New Sanitary Engineering Equipment

A four page leaflet, **New Sanitary Engineering Equipment for 1947,** is a preview of the new equipment items which the Dorr Co. featured at the A.W.W.A.-F.S.W.A. convention in San Francisco in July. The bulletin shows six new 1947 developments as follows: The Dorr 7-S Clarifier, a rugged sedimentation tank from 30 to 100 ft. in diameter; the Duo-Clarifier, a combination two-in-one unit; the Duo-Filter, a two-in-one trickling filter for primary and secondary filtration; the Type M Digester with mechanical mixers operating in a vertical draft tube and either fixed or movable gas holding covers; an External Sludge Heater of the spiral flow type; and the Dorrco Sulzer Disintegrator or screenings grinder.

This leaflet on the new Dorrco equipment may be obtained by writing the Dorr Co., 570 Lexington Ave., New York 22, N. Y.

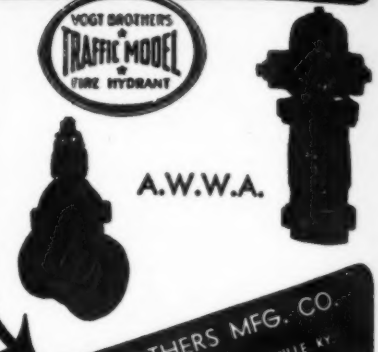
Pedestal Type Centrifugal Pump

A new bulletin telling of the operating advantages and construction features of a new line of **Pedrifugal** pedestal type centrifugal pumps has been issued by Allis-Chalmers.

The bulletin diagrams nine construction features of the pump and contains tables to permit the selection of pump size, motor operating speed, and Texrope drive to give the capacity desired. Also included are

WRITE FOR INFORMATION

VOGT BROTHERS TRAFFIC MODEL FIRE HYDRANT



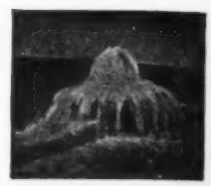
A.W.W.A.

VOGT BROTHERS MFG. CO.
MAIN AT 14th Incorporated LOUISVILLE, KY.
VOGT
VOGT MFG. CO., Incorporated
P. O. BOX 1122 LOUISVILLE, KY.

AERO-MIX

AERATOR—
MIXER

A Size and Type to Fit Your Problem In Water or Sewage Treatment.



WRITE FOR INFORMATION

INSTALLATIONS WORLD WIDE
LARGEST CITY TO SMALLEST VILLAGE

VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS
LATEST "COREY TYPE" HYDRANTS

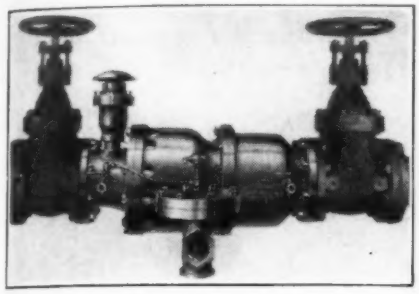
Write for Catalogue and Information
IOWA VALVE CO.
General Offices:
Hubbell Bldg., Des Moines, Iowa
Plant:
Oskaloosa, Iowa

the standard dimension tables of the Pedrifugal pump, which may be had with or without motors.

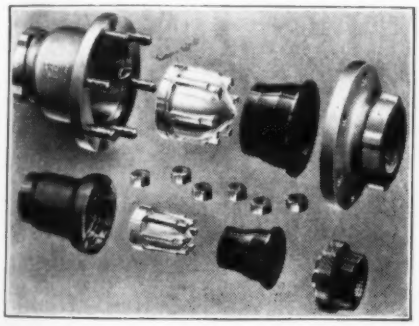
Copies of the new Bulletin 52B6691 are available on request to Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Check Valves

In Bulletin No. 610-A, the Grove Regulator Co. of 6529 Green St., Oakland 8, Calif., presents and describes the **Grove Chex-Flo Model 61 Check Valve.** Shown in the upper



photograph is the Voidalator consisting of two Chex-flo Valves. In the lower photograph are the parts of the check valve. The advantages, operating principles, and typical installations are shown in the bulletin. These valves which are sim-



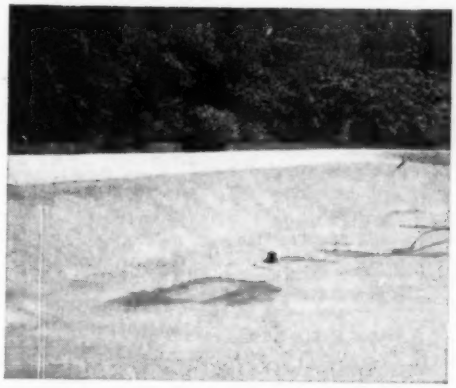
ple, trouble free check valves designed to operate in standard service handling air, water, oil or other liquids up to 180 deg. F. have high flow capacity, minimum pressure loss, and they will not stick, slam, leak, or flutter according to the information in Bulletin 610-A, which may be obtained by writing for it.

A New Motor

Not so long ago in these columns we announced the production of a **New Axial Air-Gap Motor** produced by Fairbanks, Morse & Co. of Chicago.

The story of the manufacture of that lighter, smaller power unit, as it was observed by technical trade press representatives, is presented in the May-June 1947 issue of the **Fairbanks-Morse News.**

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



RESERVOIR RELINED WITH "GUNITE"

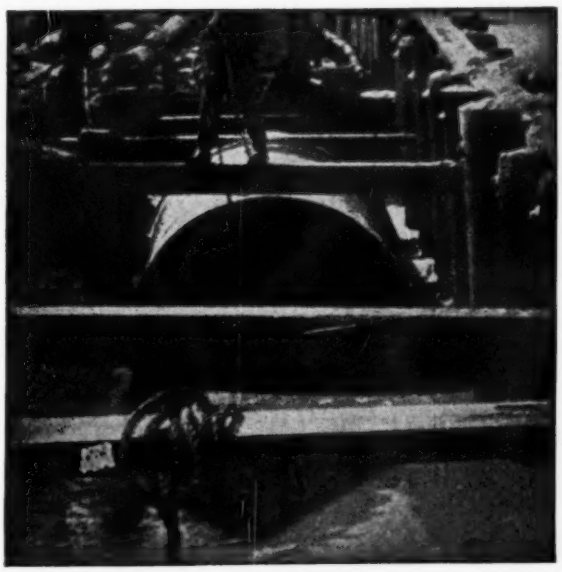
The reservoir pictured to the left is at Hellertown, Penna. This old reservoir was originally lined with concrete, which was badly cracked and disintergrated, resulting in serious leakage.

In 1945 we were awarded a contract to reline this reservoir with 2" mesh reinforced "GUNITE" with the result that the reservoir is now water-tight and better than new.

The upper photo shows the reinforcing mesh in place and the nozzle in operation. The lower photo shows the completed "GUNITE."

Our 72-page bulletin C-2300 describes scores of "GUNITE" jobs. Write for your free copy.

MANUFACTURERS OF THE "CEMENT GUN"



FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

84" pipe—Spring Lake, N. J.

CAST IRON PIPE

SIZES 2" TO 84"

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11 Broadway, New York

Warren Pipe Company of Mass., Inc.

AMERICAN GAS BOILERS
STEAM AND WATER TYPES
for Digester Heating
FOR RATINGS AND DATA SEE OUR PAGE IN THE 1947 ANNUAL REFERENCE SECTION
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AMERICAN-Standard
HEATING PLUMBING
Serving the Nations' Health and Comfort
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Your PIPE CLEANING PROBLEMS SOLVED
STEWART STEEL SECTIONAL ROD
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NO. 9A STEWART WELDED ROOT CUTTER
NO. 11—SCREW NO. 22—SPEAR SCREW
For information write for catalog.
Canadian Distributors: W. H. Cunningham & Hill Ltd., Toronto.
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Frame. Sturdy angle iron construction. Cable drum holds 1100 ft. of 3/8" cable. Shipping weight without cable 250 lbs.
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RUSTA RESTOR Keeps Tanks in Continuous Service
Modern Proved Cathodic Method Provides Lasting Protection Against Rusting — Eliminates Both the Loss of Service, and Cost, of Interior Painting.
Engineered to the individual tank and water conditions Rusta Restor, the modern, cathodic method, maintains the tank in a "neutralized" state that not only prevents rusting but also removes the products of any earlier rusting. Approved and endorsed by national and state authorities. Inexpensive to install. Operation costs two mills ($0.002) per year per sq. ft. of surface protected.
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MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.
KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT
The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.
GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT
We invite your inquiries
ROBERTS FILTER MANUFACTURING COMPANY • Darby, Pa.

Dry Chemical Feeder

In a four-page folder, the Permutit Co., 330 W. 42nd St., New York, N. Y., has presented its new **Permutit Displacement Type Dry Chemical Feeder.**

By means of a drawing and a photograph, as well as graphs of performance, the operating principles, advantages and accuracy of feeding are presented for the reader. Photographs also show the accessibility, feeder control, and specifications of the entire unit.

This bulletin may be obtained by writing for it.

Sewage Chlorinator

Wallace & Tiernan of Newark 1, N. J., has issued Technical Publication 34C, describing their **Sewage Chlorinator Type A-561.** This publication shows both the manually controlled chlorinator and the program controlled chlorinator, and describes the designed features, construction and operation of both.

The sewage chlorinator Type A-561 is especially designed for various applications of chlorination in sewage treatment, including odor control, effluent chlorination, control of sludge bulking, and reduction of hydrogen sulfide. This chlorinator makes possible the setting up of a program of controlled chlorination whereby chlorine can be added at the required amounts in spite of the many variables affecting chlorine demand.

Sewage treatment plant operators confronted with variations in total sewage flow, hourly changes in chlorine demand and flow, and storm water will be interested in this bulletin on the program controlled sewage chlorinator.

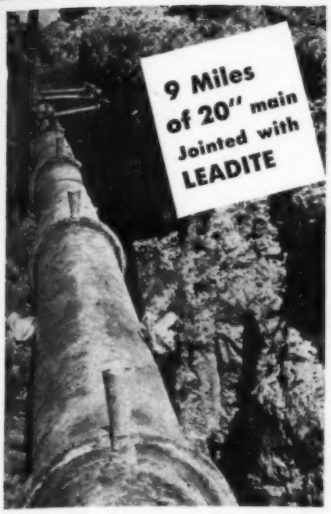
Alternating Float Switches

In Bulletin 3150, a two sheet release of the Automatic Control Co. of St. Paul, Minn., **Types HSB and HSC Floatrols** are described. The Type HSB-2 Floatrol is a two circuit float control with built-in automatic alternator specifically designed for duplex pump installations, where the second pump is needed for either additional capacity or standby service. Type HSB-3 has an additional non-alternating circuit which may be used for a third pump or as a high or low alarm circuit. Also described in the bulletin are the HSC-3 and the type HR alternators. (Sequence changers).

Bulletin 3150 is obtainable on request.

LEADITE

The Pioneer Self-Caulking Material for C.I. Pipe



Whether rough going or smooth, Leadite, for more than 50 years, has proved itself to be a very dependable self-caulking material that makes a good, tight, lasting joint!

THE LEADITE COMPANY
Girard Trust Co. Bldg. Philadelphia 2, Pa.

No Caulking

Diffuser Tube

Announcing another step forward, the Chicago Pump Co., 2349 Wolfram St., Chicago 18, Ill., introduces the new **Chicago Precision Tube** in Bulletin 177.

This new tube is described as a stainless steel core on which is wound Saran twisted cord to provide a uniformly fine-bubbled diffusion from the entire surface of the diffuser.

The bulletin shows and describes this new development which is made to increase the advantages of the wide band aeration system in both swing and stationary diffuser equipment.

Bulletin 177 may be had on request.

Cathodic Protection

Under the intriguing title **Fighting Corrosion with Corrosion,** the Electro Rust-Proofing Corp., Belleville 9, N. J., presents a mimeographed bulletin on the history and development of cathodic protection.

The bulletin contains a description of the corrosion battery and what causes corrosion of metal in contact with water, and of the cathodic protection battery which combats corrosion. The design and application and the anode design of galvanic anodes and electrolytic anodes, as well as costs of the installation, are presented in this bulletin No. T.P. 102.

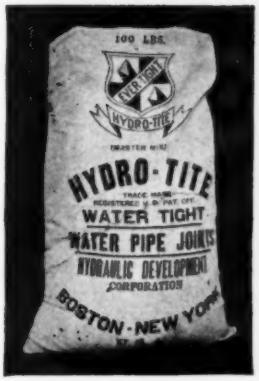
Inquiries are invited from those interested in the application of cathodic protection to steel water storage tanks, hot water storage tanks, clarifier and flocculator mechanisms in water and sewage treatment plants, etc.

C.I.P. Century Club

As announced in the July 1947 issue of **Cast Iron Pipe News,** published by the Cast Iron Research Assn., Peoples Gas Bldg., Chicago 3, Ill., a Cast Iron Pipe Century Club has been organized. At the present time there are at least 18 cities which have cast iron pipe 100 years old or older in service.

The purpose of this club is to establish a repository for records for the continued survival and use of old mains. No dues or obligations are imposed; all that is necessary is for the city to inform Thomas F. Wolfe, recording Sec'y., as to the life of the mains, and a suitable certificate of honorary membership is forwarded to the city.

HYDRO-TITE



TESTED FOR
OVER 30 YEARS

For more than thirty years water works superintendents have been using Hydro-tite for joining bell and spigot pipe. They have found that this self-caulking, self-sealing compound costs less to buy, requires less labor, makes tighter joints and withstands the effects of time, strain and vibration. Send for data book and sample.

ALWAYS USE FIBREX, the bacteria-free packing for pipe joints. Send for sample.

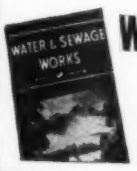
HYDRAULIC DEVELOPMENT CORPORATION
Main Sales Office: 50 Church St., New York, N.Y.
Works: West Medford Station, Boston, Mass.

2. Tips On Space Buying

Not His Ship — But The Right Magazine!

Just think of all the Space Buyers who keep looking for that one right magazine. You know that seldom is one found to be 100% effective for any advertiser. You'll probably agree that most space buyers take some of the bad along with the good. To find the most good you must study the facts. In the Water and Sewage field you'll find the facts all point to WATER & SEWAGE WORKS — the **only** publication covering both fields.

For Additional Facts And Proof
Write or Call Mr. Cocker Today
Ask For Media File Folder
Latest Folder — Just Published



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FEED-METERS-MIXES CHLORINE GAS ACCURATELY

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PURIFICATION FOR WATER-SEWAGE & SWIMMING POOLS

Everson SterElators Operate Manually or Semi-Automatically, Also Automatically Proportion Gas Flow to Water Flow.

Everson SterElators Utilize a 24" Water Gauge Vacuum and Visible Flow Meters, with Wide Ratio Ranges of Capacities: 10 to 1, 50 to 1, 110 to 1.

All SterElators Are Dependable, Accurate, Safe and Easy to Operate. Guaranteed to Give Complete Satisfaction.

SterElators by Everson

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233 W. Huron Street
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Asbestos Cement Pipe

If you are interested in power plants of yesterday, you will find some very fine pictures in the July-August 1947 issue of **The Power Specialist** published by Johns-Manville, 22 E. 40th St., New York 16, N. Y.

For the technically-minded reader concerned with the transportation of salt water disposal, there is an article on the use of 16 miles of transite pipe for this purpose.

Adjustable Speed Motor

A new four-page bulletin describing an alternating current motor having infinitely adjustable speed is now available. This is the **Ajusto-Spede,** described in Bulletin No. 611-C of the Louis Allis Co. of Milwaukee 7, Wis. The bulletin describes how the Ajusto-Spede operates directly from a 2- or 3- phase A.C. line. The motor will produce constant torque throughout its operating speed range. Continuous duty speed ranges as high as ten to one are possible in the smaller sizes according to Bulletin No. 611-C which may be obtained by writing for it.

Condensation Return Units

Most persons who have occasion to think about water and sewage works seldom think of the many accessories and various units not concerned directly with the treatment of water and sewage, but which are absolutely necessary to the proper operation of the works. Such things, for example, as condensation return units and boiler feed pumps. These items are extensively useful in large plants which cover a considerable area with a number of buildings heated by a central heating unit, and we know of several such installations. We do not know whether or not these particular installations are

Deming Condensation Return Units

and boiler feed pumps as described in Bulletin No. CR-1 of that company, but we do know that persons interested in such units will find in that catalog all of the information necessary for the selection and installation of such items. We suggest that Engineers and superintendents of water and sewage works, as well as designers, will find bulletin No. CR-1 of interest and we suggest you write the Deming Company, Salem, Ohio for a copy.

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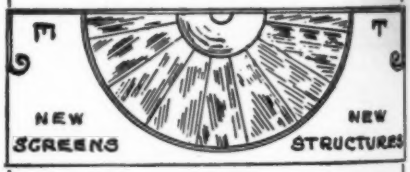

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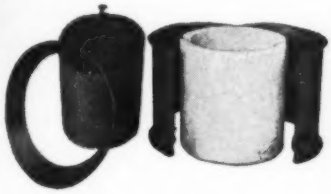

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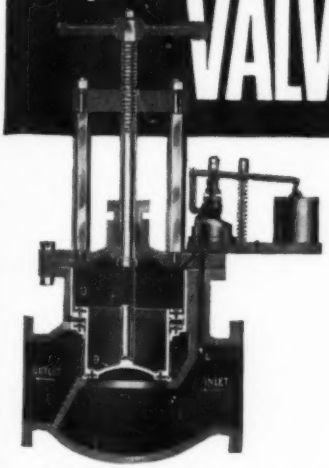

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Protective Coating

In the **Dearborn News**, Vol. 102, No. 2, published by the Dearborn Chemical Co., 310 S. Michigan Ave., Chicago 4, Ill., there is a short item on the Advantages of No-Ox-Id in the Water Works Industry.

No-Ox-Id is a highly corrosion-resistant waterproofing and rust preventive coating which has been used to line pipe, coat valves, and prevent leakage through joints and cracks of concrete settling basins.

Water, Sewage, and Industrial Waste Treatment Equipment

In Catalog 775A, the Jeffrey Mfg. Co., Columbus 16, Ohio, has presented its latest bulletin on **Jeffrey Equipment for Water, Sewage, and Industrial Waste Treatment Plants.**

This revised bulletin contains sections on screening and mechanically cleaned screens, screening grinders, industrial waste screens, dewatering conveyors, scraper type grit collector, V-bucket type grit collector, grit washer (the Jeffrey Jigrit Washer), biofiltration system, primary settling tanks, secondary settling tanks, cross-collectors, scum removers, and chemical feeders.

There is also a section devoted to the clarification of water, sewage or trade wastes by the Jeffrey Floctrol process, which is a patented flocculation control system.

The last section of the book is devoted to garbage grinders for dual disposal plants. Designs for typical installations are shown.

This 44-page catalog 775A may be obtained on request.

Treating Industrial Waste

In Volume 13, Number 1 of *The Rex World*, there appears an item titled **Treating Industrial Waste.** In addition to comments on the problem of treating industrial wastes, there is a flow diagram showing the installation of Rex Vibrating Screens, Flash Mixers, and Slo-Mixers prior to Settling Tanks wherein Rex Sludge Collectors operate. Pictures accompany the flow diagram to show the vibrating screen, the mixers, and the conveyor sludge collectors. This type of equipment is useful in the treatment of industrial wastes before discharge into streams or pre-treatment of wastes before discharge into sewers.

The Rex World is published by The Chain Belt Co., Milwaukee, Wis. and may be obtained by writing to the company in Milwaukee or to any of the numerous branch offices.

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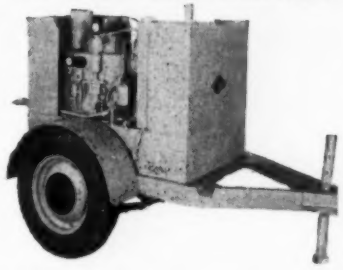

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Rubber Packing for Bell Joints

In a four page bulletin, titled **Flexo-Pac Yarning Material,** the Rice-Chadwick Rubber Co. of Killbuck, Ohio, shows the Wedge Type Flexo-Pack and the Round Type Flexo-Pack. The bulletin presents several advantages of the yarning material, which is described as the pioneer rubber packing for yarning joints on bell and spigot cast iron water pipe. This bulletin may be obtained on request.

Centrifugal Pump

The Peerless Fluidyne centrifugal pump is described in a bulletin recently issued by the Peerless Pump Div., Food Machinery Corp., Los Angeles 31, Calif. This bulletin describes types PE and PB of this single stage, end suction vertically split casing centrifugal pump. Direct connected motor units and direct connected through flexible coupling units as well as belt-driven units are available.

The bulletin shows the construction details, and gives further information on how to select a type of pump which is designed to move water or other liquids in capacities up to 1000 gpm. against heads up to 270 ft., with power drives from fractional to 20 hp.

Slurry Pump

The Pettibone Mulliken Corp., 4710 West Division Street, Chicago 51, Ill. has just published a 16 page bulletin on its **Slurry Pump,** whose wear parts are centrifugally cast of abrasion resistant Diamond alloy. The bulletin contains complete, detailed description, engineering and pumping data, selection chart, dimensions, assembly drawings, etc. The bulletin may be obtained by writing for it.

Water Analysis

The third edition of **Water Analysis** has been issued as Bulletin No. 11 of the Solvay Technical and Engineering Service of the Solvay Sales Corp., 40 Rector St., New York, 6, N. Y. This third edition is a revision of the former bulletin on Methods of Analyzing Waters for Municipal and Industrial Use.

The bulletin is designed to present methods suitable for rapid work without undue sacrifice in accuracy. The book contains sections on mineral analysis, stationary boiler water analysis, municipal and railroad water supplies, swimming pools, and stream pollution. Also included in the bulletin is information on reagents, indicators, standard solutions, conversion tables, and a list of atomic weights.

Copies of Solvay Technical and Engineering Service Bulletin No. 11 on Water Analysis are available on request.

Glass Covered Sludge Beds

Lord & Burnham of Irvington, N. Y., has a series of Engineers' Service Sheets which cover the sizes and areas of sludge bed glass enclosures. These several sheets cover areas from 397 to 22,095 sq. ft., and show the standard design as well as presenting specifications for the glass enclosures.

Persons interested in the construction of glass covered sludge beds may find these Engineers' Service Sheets of help.

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Automatic Backwash Filter

The Hardinge Automatic Backwash Rapid Sand Filter, as manufactured by the Hardinge Co., Inc., 240 Arch St., York, Pa., is shown in a four-page bulletin just issued by the company.

This folder shows the construction and operation of the filter, describes the principles of operation, and gives a number of locations of installations.

Mechanical Joints

A bulletin on **Standardized Mechanical Joint Cast Iron Pipe and Fittings** is available from the U. S. Pipe & Foundry Co., Burlington, N. J.

The bulletin contains information on weights and dimensions of these various items, general specifications, and other information of interest. Standard mechanical joint cast iron pipe and fittings can be furnished tar coated inside and outside, or tar coated outside and lined inside with cement lining if intended for water or sewer service.

This bulletin is available on request.

Water Meters

The four-page folder of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y., gives the list prices and specifications of the **American and Niagara Water Meters.** In addition, specifications and photographs are shown of the various meters and the parts thereof.

Link-Belt Products

On the front page of Book No. 1953-A, Link-Belt Co. of Chicago suggests that the reader "keep this book handy." The **Directory of Link-Belt Products** lists "the equipment Link-Belt makes for elevating, conveying, screening, drying or for the mechanical transmission of power."

This particular directory contains the alphabetical list of products and catalogs available, the trade names of products, where Link-Belt products are made, advice on where to get immediate service, lists of products by industries, suggestions as to how to get copies of catalogs, and a pledge of service.

This handy book, which will be of interest to water and sewage works men, as well as other users of Link-Belt products, may be obtained on request.

Instrumentation and Control

Complete Instrumentation and Control for Water Filtration Plants is the title of a four-page leaflet ussued by Builders-Providence, Inc., Providence 1, R. I. The center double spread shows a cutaway drawing and diagram of a filter plant and shows the location of various types of control instruments used in the operation of a filter plant.

Bulletins are available on these various items.

Water Well Casing

Western Pipe & Steel Co., 444 Market St., San Francisco has issued Catalog B30 on **Water Well Casing.** The bulletin is a complete catalog of the various sizes and types of well casing for water wells.

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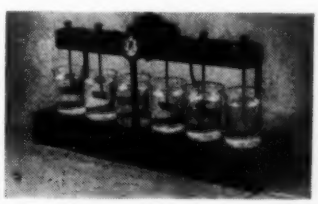

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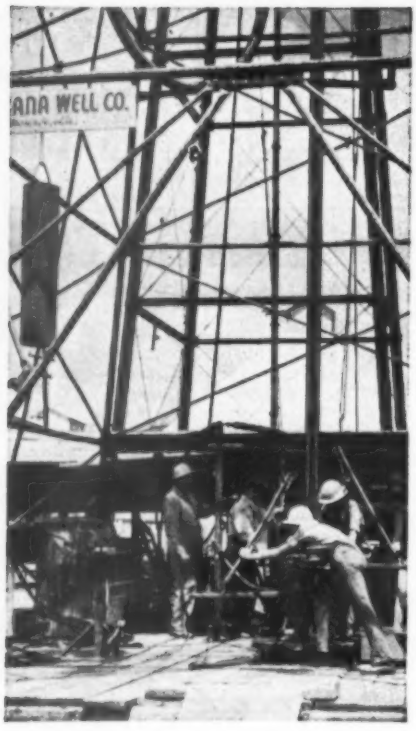

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Index TO ADVERTISERS

A

Albert Pipe Supply Co. 107A
*Allis-Chalmers 20A-21A
American Brass Company, The 8A
*American Radiator & Standard Sanitary Corp. 106A
*Anthracite Equipment Co. 110A
*Atlas Mineral Products Co. 93A
Aurora Pump Co. 88A
Automatic Control Co. 102A

B

Badger Meter Mfg. Co. 19A
*Bailey Meter Co. 99A
Blaw-Knox Co. 40A
Buffalo Meter Co. 90A
*Builders Iron Foundry 37A
*Builders-Providence, Inc. 37A
*B/W Controller Corp. 40A

C

*Calgon, Inc. 45A
Carborundum Co., The 6A, 7A
Carson Cadillac Co. 110A
Cast Iron Pipe Research Ass'n .. 22A, 23A
Cement Gun Co. 105A
Centriline Corp. 35A
Chain Belt Company 18A
Chemical Equip. Co. 104A
Chicago Bridge & Iron Co. 17A
*Chicago Pump Company 87A
Chapman Valve Mfg. Co., The .... Inside Front Cover
Crane Co. 26A

D

Dean & Co., Payne 102A
De Laval Steam Turbine Co.....10A, 41A
Diamond Alkali Company 13A
Dresser Manufacturing Co. 43A

E

Eddy Valve Company 89A
Edson Corporation, The 110A
Everson Mfg. Co. 108A

F

Fairbanks-Morse 34A
*Fitzgerald, J. C. 111A
Flexible Sewer Rod Equipment Co. . 96A
Flexible Underground Pipe-Cleaning Co. 96A
Ford Meter Box Co. 109A

G

General Chemical Co. 15A
General Electric Co. 46A, 47A
Glauber Brass Mfg. Co. 91A
*Golden-Anderson Valve Spec. Co..... 109A
Gorman-Rupp Co., The 36A

H

*Hellige, Inc. 102A
Hydraulic Development Corp. 107A

I

*Infilco, Incorporated 98A
Iowa Valve Co. 104A

J

*Jeffrey Manufacturing Company 27A
*Johns-Manville 12A, 24A, 25A
Johnston & Jennings Co. 106A

L

Layne and Bowler, Inc. 114A
Leadite Company 107A
Liquid Conditioning Corp. 42A
Lock Joint Pipe Co. .. Inside Back Cover
Ludlow Valve Mfg. Co. 14A

M

*M. & H. Valve & Fittings Co. 97A
Mathews Hydrants 92A
Mathieson Alkali Co. 4A
Meter Specialty Co. 111A
Mueller Company 100A

N

National Tech. Labs. 9A
National Water Main Clean. Co. 97A
Neptune Meter Company..... 58A
Niagara Alkali Co. 11A
Northrop & Co., Inc. 110A

O

Oakite Co. 109A
Omega Machine Co. 103A

P

Pacific Flush-Tank Company 108A
Payne Dean & Co. 102A
Peerless Pump Division 101A
Pennsylvania Salt Mfg. Company 29A
Phipps & Bird, Inc. 111A
Pittsburgh Equitable Meter Co. 3A
*Pitfsburgh-Des Moines Steel Co..... 33A
Portland Cement Ass'n. 28A
*Proportioneers, Inc. 92A

R

Roberts Filter Mfg. Co. 100A
Rockwell Mfg. Co. 3A
Roots-Connersville Blower Corp. 95A
*Ross Valve Mfg. Company 103A
Rusta Restor 100A

S

*Simplex Valve & Meter Co. 18A
Solvay Sales Corp. 100A
Stewart, W. H. 106A

T

Tate Pipe Linings, Inc. 94A
Taylor Co., W. A. 109A
Thomson Meter Co..... 50A

U

*U. S. Pipe & Fdry. Co. 39A

V

*Vapor Recovery Systems Co. 38A
Va. Smelting Co. 40A
Vogt Brothers Manufacturing Co. ... 104A
Vogt Manufacturing Co. 104A

W

*Wallace & Tiernan Co., Inc. .. Back Cover
Warren Foundry & Pipe Corp. 105A
Westinghouse Electric Corp. 30A, 31A
Wood Company, R. D. 32A
Worthington Pump & Mach. Co. 44A

Z

Zeolite Chemical Co. 111A

*Advertisers with * were represented in the July, 1947, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

Consulting Engineers 112-A, 113A

1925 (Above)—Installing pipe for first Lock Joint contract in Washington.

1944 (Top)—Lock Joint Prestressed Concrete Pipe at manufacturing plant—ready for installation in Washington, D. C.

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Nerve center of our nation, Washington, D. C. requires an unfailing water supply system for its tremendously increasing population. During the past 20 years the capital's engineers have installed Lock Joint Reinforced Concrete Pressure Pipe on 11 major water supply projects for the city. The wisdom of selecting Lock Joint Pipe is evidenced in the unfailing service, continued high carrying capacity and negligible maintenance cost of these vital lines whose life expectancy is in excess of 100 years.

Repeat orders from Washington and many other key cities are a tribute to the reliability, high quality and unfailing service of Lock Joint Reinforced Concrete Pressure Pipe.

SCOPE OF SERVICES—*Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.*

For future projects, large or small, specify Lock Joint Pipe.

A Hazen-Williams Hydraulic Slide Rule will gladly be sent upon request with our compliments.

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(Continued on Page 2)

she was discharged.

'Break Point' Chlorination Gives Hagerstown Much 'Sweeter' Water

That unpleasant "after" taste in your drinking water is gone and believe it or not it is an extra heavy "shot" of chlorine daily that is giving Hagerstown consumers the purest, sweetest flavored mountain water they have ever had.

And it's only costing the taxpayers around $1.50 more daily to get the improved water.

The "break point" chlorination principle, now in use in the water systems of approximtaely 270 American cities, including both Baltimore and Washington, was first introduced into Hagerstown's mountain water about two weeks ago. Extensive laboratory studies and tests were made by Robert W. King, chemist for the Water Department, before the additional chlorine was added to the treatment of water coming from the city's two mountain reservoirs.

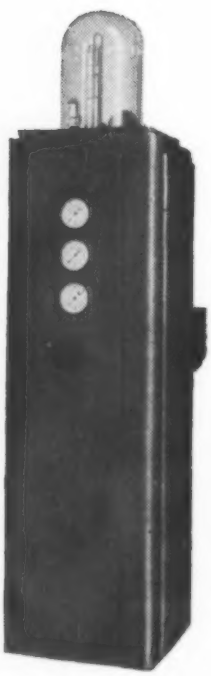
Under the "break point" principle, enough chlorine is added to the water to burn up all organic matter, plant and bacteria. Heretofore, ammonia also was used along with chlorine in purifying the water, but a six year study by leaders in the chlorine industry showed that when ammonia is used along with chlorine the after taste is accentuated. By use of additional chlorine and no ammonia it has been found that there is no after taste once the amount of necessary chlorine to completely burn up plant matter and bacteria is ascertained.

Tests made by the local chemist showed that about 50 percent more chlorine than was used with ammonia was needed to render the water 100 percent free of bacteria and at the same time leaving no after taste.

Now studies are being made of the water from the Potomac river, which makes up about one-third of the water supplied to Hagerstown daily, with an idea later of using the "break point" principle on the river water.

Several years ago the Potomac river water's flavor also was considerably improved by the use of black alum. It was not uncommon during the summer months, when this "river" flavor was most noticeable, for the water department office to be swamped with complaints on the "taste" of the water. But the use of black alum removed this disagreeable flavor and the complaints have been few.

Reproduced from the Hagerstown, Md. Daily [illegible] March 29, 1946



This is bu[illegible]ne of the many benefits of the Break-Point [illegible]ess. Your W&T Representative will be glad [illegible]ll you how it can also give you improved c[illegible]agu[illegible]lation, longer filter runs, better algae contr[illegible], help in iron, manganese and color removal and the elimination of all gas-formers.

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